YORK CENTRAL FIRE STATION
YORK, NE

PROJECT MANUAL

J□□□ 14, 2024

SCHEMMER PROJECT NO. 09272.001

SCHEMMER

Design with Purpose. Build with Confidence.

SECTION 00-0007 – SEALS PAGE

COORDINATING PROFESSIONAL

Schemmer

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1045 N. 115th Street, Suite 300

Omaha, NE 68154

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175 Century Square Drive, Suite 350

College Station, TX 77840

(979) 694-1791

06/14/2024

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Matthew Hubel, PE, CPSWQ, LEED AP BD+C, Team Leader Public Sector

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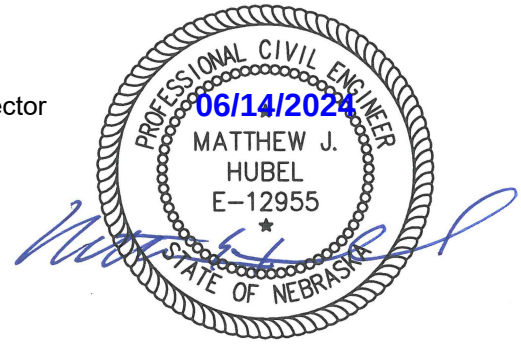

STRUCTURAL ENGINEER:

Schemmer

Joshua M. Pearce, PE, Structural Engineer

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MECHANICAL ENGINEER:

Schemmer

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ELECTRICAL ENGINEER:

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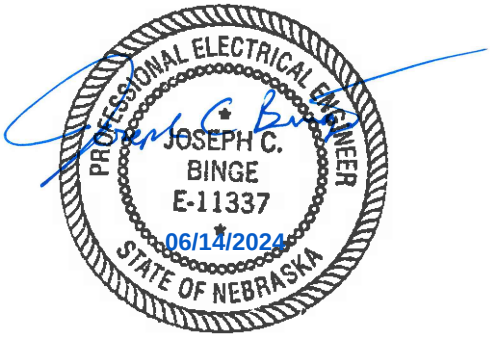

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SECTION 00-1113 – ADVERTISEMENT FOR BIDS

1.01 PROJECT INFORMATION

A. Notice to Bidders: Qualified bidders may submit bids for project as described in this Document. Submit bids according to the Instructions to Bidders.

B. Project Identification: York Fire Station No. 1
   1. Project Location: 1714 N. Lincoln Avenue, York, NE 68467

C. Owner: City of York
   1. Owner's Representative: Dr. Sue Crawford, City Administrator

D. Coordinating Professional:
   1. Dan Kerns, AIA, NCARB,
      Principal
      Executive Manager, Architecture
      Commercial Market Leader
      (402) 493-4800
      dkerns@schemmer.com

E. Project Description:

   Project consists of new construction of a 23,400 sf fire station and fire administrative building for the City of York Nebraska. The project will be located at the intersection of Lincoln Avenue and E. 17th Street and will extend to N. Grant Avenue taking the place of the current Road 6 Customs property.

   The seven bay fire station has sleeping accommodation for seven, a kitchen, dining and day room, fitness area, bathrooms, and apparatus bay support spaces. The administrative functions for the building include offices, conference / lounge spaces, training room and public restrooms. Located on the second floor are the mechanical, electrical, and IT rooms.

   The wood and CMU framed structure has support steel to assist in carrying loads and an ICC-500 storm shelter. Exterior materials are brick and fiber cementitious siding with composition shingles.

F. Construction Contract: Bids will be received for the following Work:
   1. General Contract (all trades).

1.02 BID SUBMITTAL AND OPENING

A. Owner will receive sealed lump sum bids until the bid time and date at the location given below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:
   1. The contractor shall identify their sealed bid by writing the Project Identification, as indicated above, on the outside of the envelope.
   2. Bid Date: 07/12/2024
   3. Bid Time: 11:00 a.m., local time.
   4. Location:
      City of York Municipal Building
      100 E. 4th Street, York, Nebraska 68467
      Attn: Amanda Ring, City Clerk

B. Sealed bids shall be accompanied by a bid bond from a reliable surety company in an amount not less than five (5 percent) percent of the total maximum bid price payable without recourse to the City of York, as a guarantee that the bidder will enter into a contract and execute Performance Bond within ten (10) days after notice of award of contract to him.

C. Bids will be thereafter publicly opened and read aloud.

D. Bids received after the specified time will be returned unopened to the sender.

E. Submitting general contractors shall provide the State of Qualifications Document with their bid. Sample document can be found in project forms within the project manual.

1.03 BID SECURITY

A. Bid security shall be submitted with each bid in the amount of five 5 percent of the bid amount. No bids may be withdrawn for a period of Sixty 60 days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

1.04 PREBID MEETING

A. Prebid Meeting: A Prebid meeting for all bidders will be held at:

City of York Municipal Building | Council Chambers
100 E. 4th Street, York, Nebraska 68467

Date: 06/25/2024 Time: 2:00 PM, local time

B. Prospective prime bidders are not required to attend.
1. Bidders' Questions: Architect will provide responses at Prebid conference to bidders' questions received up to two business days prior to conference.

1.05 DOCUMENTS

A. Viewing Procurement and Contracting Documents: Examine after 06/14/2024, at the locations below:
1. https://schemmer-my.sharepoint.com/:f:/p/dkerns/ErxDwyEIS9FKk1H7quE_65cBfBiWK8Om_BGgknVjaqIQCQ?e=CFRvLN

1.06 TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. Successful bidder shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time. Work is subject to liquidated damages.

B. For each calendar day that any work shall remain uncompleted after the time specified in the bid and the contract, or the increased time granted by the Owner, or as equitably increased by additional work or materials ordered after the contract is signed, the sum of **$500** per calendar day, unless otherwise specified in the special provisions, shall be deducted from the monies due the Contractor.

1.07 BIDDER'S QUALIFICATIONS

A. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work.

B. The right is reserved as the interest of the City may require the rejection of any and all proposals and to waive any informality in proposals received.

1.08 NOTIFICATION

A. This Advertisement for Bids document is issued by Amanda Ring, City Clerk and is located on the City of York website.

1.09 TITLE VI

A. The City of York, in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C 2000d to 2000d-4 and Title 49, Code of Federal Regulations, Department of Transportation, Subtitle A, Office the Secretary, Part 21, Nondiscrimination in Federally assisted programs of the Department of Transportation issued pursuant to such Act, hereby notified all bidders that it will affirmatively insure that in any contact entered into pursuant to

this advertisement, minority business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin, sex, age and disability/handicap in consideration for an award.

1.10 SECTION 504/ADA NOTICE TO THE PUBLIC

A. The City of York does not discriminate on the basis of disability in admission of its programs, services, or activities, in access to them, in treatment of individuals with disabilities, or in any aspect of their operations. The City of York also does not discriminate on the basis of disability in its hiring or employment practices.

B. This notice is provided as required by Title II of the Americans with Disabilities Act of 1990 and Section 504 of the Rehabilitation Act of 1973. Questions, complaints, or requests for additional information or accommodation regarding the ADA and Section 504 may be forwarded to the designated ADA and Section 504 compliance coordinator.

C. Questions, complaints or request for additional information or accommodation regarding the ADA and Section 504 may be forwarded to the designated ADA and Section 504 compliance coordinator:

1. James Paul
   Phone number (Voice/TDD): 402-363-2600
   Office Address: 100 E. 4th St., York NE 68467
   Email: ADA@cityofyork.net

END OF DOCUMENT 00 11 13

SECTION 00-2113 – INSTRUCTIONS TO BIDDERS

1.01 INSTRUCTIONS TO BIDDERS

A. AIA Document A701, "Instructions to Bidders," is hereby incorporated into the Procurement and Contracting Requirements by reference.
   1. A copy of AIA Document A701, "Instructions to Bidders," is bound in this Project Manual.

END OF DOCUMENT 00 21 13

SECTION 00-003132 – GEOTECHNICAL DATA

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.

B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.

C. Log of borings indicates materials penetrated at specific locations. Owner and/or Architect assume no responsibility for any conclusions or interpretations made by Contractor related to information included in the Report. Should contractor require additional information concerning subsurface conditions, they may, without cost to Owner, make additional investigations. Should additional investigations produce information different from that in Soil Report, Contractor shall promptly notify Owner in writing.

D. Contractor shall read and otherwise become completely familiar with contents of Soil Report, including but not limited to its recommendations for preparation of subsoil, bases, sub-bases and fill and construction of building foundations and parking surfaces in compliance with recommendations in Report. Should discrepancies be found between the requirements of Soil Report and the drawings and/or specifications, contractor shall notify Owner in writing prior to beginning work.

E. A geotechnical exploration report for Project was prepared by Schemmer dated March 12, 2024 with applicable addendums as appended to this Document.
   1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
   2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.

1.03 EXISTING CONDITIONS

A. Bidders shall visit the site of work, existing buildings, review any available existing drawings, and all conditions affecting the work of this project. Any claims after contract award for difficulties encountered which could have been foreseen by such site review, as determined by Architect and Owner, will not be recognized by the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 00 31 32

REPORT OF GEOTECHNICAL EXPLORATION

FIRE STATION
YORK FIRE DEPARTMENT
1714 NORTH LINCOLN AVENUE
YORK, NEBRASKA

MARCH 12, 2024

SCHEMMER PROJECT NO. 09272.001

SCHEMMER

Design with Purpose. Build with Confidence.

SCHEMMER

Design with Purpose. Build with Confidence.

March 12, 2024

Mr. Berry Redfern
Mayor
City of York, NE
100 East 4th Street
York, NE 68467

RE: Report of Geotechnical Exploration
Fire Station
York Fire Department
1714 North Lincoln Avenue, York, Nebraska
Schemmer Project No. 09272.001

Dear Mr. Redfern:

The Schemmer Associates Inc. has conducted a subsurface exploration program and prepared site preparation, parking lot, building area, and foundation recommendations for the referenced project. This work was performed in accordance with your authorization.

The opinions expressed in this Report are based upon our understanding of the proposed project and the data obtained from our subsurface exploration. Should there be any changes as the project develops, we should be requested to review such new conditions.

Thank you for this opportunity to work with you on this project. Should you have any questions, please contact us.

Sincerely,

THE SCHEMMER ASSOCIATES INC.

Loras A. Klostermann

Loras A. Klostermann, P.E.
Senior Geotechnical Engineer
Shareholder

Cc: Mr. Danieal Kerns, AIA, The Schemmer Associates Inc
Mr. Matthew J. Hubel, PE, CPSWQ, LEED AP BD+C, The Schemmer Associates Inc
Mr. Nathan Schmidt, PE, The Schemmer Associates Inc

PHONE 402.493.4800
FAX 402.493.7951
1044 North 115th Street, Suite 300
Omaha, Nebraska 68154-4436
SCHEMMER.COM

EXECUTIVE SUMMARY

The Schemmer Associates Inc. has completed this geotechnical exploration for the proposed New Fire Station for the City of York, Nebraska. This new structure will be built on the west half of the property currently used as a parking lot located northeast of the intersection of East 17th Street and North Lincoln Avenue. An existing retail, warehouse-type structure on the east half of the property will be demolished to make way for a new fire station parking and truck maneuvering area.

The project site was a residential neighborhood until the existing big-box store was constructed sometime in the early to mid-1970's. Available aerial photography suggests to us that 7 to 8 single-family residences with full basements existed on this property. The site was leveled to some degree to construct the existing retail building and the parking lots, but the grading plan for the previous site development has not been provided.

The site exists within the loessial uplands overlooking an alluvial terrace above the current floodplain of Beaver Creek. Soil consists of Peoria loess. We are aware that Loveland Formation underlain by Pleistocene Sand deposits exist below the Peoria loess. Bedrock below this area usually consists of layers of sandstone and siltstone with some shale. We did not encounter the Loveland Formation within a depth of 20 feet below existing grade. The Peoria loess at this site exists in a moist to very moist and stiff to medium stiff condition. A groundwater table was not encountered within a depth of 20 feet.

Due to the uncertainty of the completeness of previous house demolition, methods of demolished and backfilled, and the fact that fill soil does not support building components in the same manner as natural soils we recommend site preparation be completed prior to building construction. We recommend mass overexcavation and soil replacement below the building area to a depth of four feet below existing grade or five feet below the finished floor slab, whichever is deeper. Care shall be taken by the contractor to identify the old basement areas and be sure that no debris or poorly quality fill remains below the new building site. Any debris or poor-quality fill shall be removed and replaced. Additional recommendations are provided in this Report.

A building finished floor level of 1646.5 0 feet has been determined. This finished floor level will require placement of up to 4 feet of fill above existing grade at the southwest building corner. Significant settlement due to subsoil consolidation will occur below site areas where the fill thickness above existing grade exceeds 1 foot. We recommend the placement of a temporary surcharge to the residential portion of the fire station and a portion of the apparatus garage, the south part of the structure. Soil overexcavation but no surcharge is recommended for the rest of the apparatus garage area.

A single-story building with a partial second story level is proposed. A maximum column load of 50 kips with a maximum wall load of 5.5 kips per lineal foot were provided. The floor slab to support apparatus and equipment storage has a design load of 250 pounds per square foot. The office and residential portion of the slab-on-grade floor will support a design load of 150 pounds per square foot. A storm shelter will be constructed within a portion of the residential area. The site soils after site preparation are suitable for normal shallow footing and floor slab support.

REPORT OF GEOTECHNICAL EXPLORATION
YORK FIRE STATION
1714 NORTH LINCOLN AVENUE, YORK, NEBRASKA
MARCH 12, 2024
SCHEMMER PROJECT NO. 09272.001

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REPORT OF GEOTECHNICAL EXPLORATION
YORK FIRE STATION
1714 NORTH LINCOLN AVENUE
YORK, NEBRASKA

MARCH 12, 2024
SCHEMMER PROJECT NO. 09272.001

1.0 INTRODUCTION

1.1 Project Information

This Report summarizes subsoil exploration work, laboratory test results, and geotechnical engineering conclusions and recommendations by The Schemmer Associates Inc. (Schemmer) for design of the proposed York Fire Station for the York Fire Department in York, Nebraska. Recommendations for site preparation and parameters for structure design are provided.

1.2 Scope of Service

The scope of service for this subsoil exploration was limited to:

1. Advance five (5) soil borings to a depth of 20 feet below existing grade.
2. Perform laboratory tests to aid in classifying the soils and estimating their engineering properties; and,
3. Analyze results of laboratory testing to determine site recommendations regarding the following:
    a. Description of site soil conditions and significance of area geology.
    b. Foundation and site preparation recommendations to provide stable floor and building support.
    c. Minimum depth to suitable bearing material for foundations and allowable soil bearing pressures for shallow footing design.
    d. Recommendations for site preparation if soft or otherwise unsuitable soils are found at foundation and floor support levels.
    e. Recommended removal of existing structure components.
    f. Frost depth requirements for the foundation system.
    g. Recommendations for radon gas mitigation, if required.
    h. Analysis of site soil to ascertain the presence of potentially expansive soils or otherwise deleterious materials, and should they be found, provide recommendations to mitigate detrimental effects from these materials.
    i. Recommended types of fills and backfill soil materials and compaction requirements for support of structures.
    j. Active, passive, and at-rest lateral earth pressures for use in design of lateral earth-supporting footings to support wind and other lateral forces.
    k. Anticipation and management for drainage of surface water and groundwater.
    l. Pavement subgrade design recommendations.
    m. Floor subgrade design recommendations.
    n. Seismic design parameters required by building code; and
    o. Potential for settlement due to consolidation with recommendations to control potential building settlement due to placement of fill above existing grade and alleviate excess stress on structure components associated with settlements.

1.3 Report Format

The purposes of this Report are to describe our field observations, to present field and laboratory test results, and to provide geotechnical engineering recommendations based on the subsoil conditions encountered in conjunction with the proposed construction features. Provided in the Appendix to this Report are a Boring Location Plan, Logs of Test Borings, a Summary of Soil Test Results, a page describing Classification of Soils for Engineering Purposes, and a page listing General Notes defining symbols and terms listed on the boring logs and in this Report.

2.0 EXPLORATION RESULTS

2.1 Scope of Field Exploration

A total of five test borings, labeled B-1 through B-5, were advanced for these analyses on November 30, 2023, for the purpose of gathering area subsurface data. Boring locations were determined based on preliminary development information and the proposed construction characteristics. A building conceptual location onsite had not been determined until December of 2023. Additional building data and revised building layout were provided only recently by the design team.

Borings were placed at locations allowed by safety considerations and existing surface and subsurface features including existing buildings, buried and overhead utilities, and to provide coverage of the proposed construction areas. The driller contacted the One-Call utility locate system to remove conflicts with buried utility lines. The City of York was contacted to provide locations of any private utilities that might exist at the site and are not located by One-Call. The boring locations are shown on the Boring Location Plan provided in the Appendix to this Report.

2.2 Laboratory Test Program

Tests performed on the selected soil samples included water content, dry unit weight, unconfined compressive strength, Atterberg limits, and visual classification. Results of the laboratory tests are summarized in the Appendix to this Report. Each test was performed in conformance with the current ASTM or state-of-the-art test procedures at the Schemmer soil testing laboratory by trained technicians using calibrated equipment.

Based on the results of the testing program, the field boring logs were reviewed and supplemented as presented in the Appendix. These final logs represent our interpretation of the in-place soil conditions at each boring location.

2.3 General Geology

The general bedrock geology of this area consists of sandstone and siltstone with some shale bedrock of the Pennsylvanian Age. Bedrock was naturally covered by a vast sand and gravel deposit termed “Pleistocene Sand”. Pleistocene Sand is a fine to coarse sand with gravel deposit placed about the time of the earliest area continental glaciers. Pleistocene Sand away from major creeks and rivers in this area was covered by Loveland Formation, a clay soil. Loveland Formation was subsequently covered by Peoria loess during the most recent glacial age within North America, the Wisconsin glacial period, with a thickness of more than 20 feet.

2.4 Site Surface Conditions

The area's upland topography consists of shallow rolling hills with shallow drainage swales. The project site was a residential neighborhood until the existing big-box store was constructed sometime in the early to mid-1970's. Available aerial photography suggests to us that four single-family residences with three to four detached garages existed over the west half of the property, within the proposed fire station building area. The available data suggests to us that three to four single-family houses with three to four detached garages existed in the area of the existing big-box store building, where new pavements will be constructed after demolition of the existing building. No data is available as to how those previously existing houses were demolished and if any debris remains onsite, buried below grade. We estimate the houses had full basements to depths of 7 to 8 feet below grade based on visual review of nearby homes from the streets.

The site was leveled to some degree to construct the existing retail building and parking lots. We estimate that soil was cut from the northeast corner of the site and some fill was placed over the southern half of the existing building area. The grading plan for the previous site development has not been provided.

Pavement and an existing building cover the entire site. Overhead light structures exist within the parking lot. No green spaces exist. Overhead power distribution lines exist within the alley that crosses the center of the site, in a north-south orientation. A sanitary sewer, gas main, and communication utilities are known to also exist within this alley.

2.5 Subsurface Conditions

The subsurface conditions encountered in the borings have been used to infer the general soil conditions at the site. Schemmer assumes the soil conditions between borings are fairly represented by the borings. If soil conditions other than those described below and as shown on the Boring Logs are found during construction, it is important that the geotechnical engineer from Schemmer be informed to evaluate the exposed conditions with respect to their effect on our recommendations.

The following is a brief review of the various layers of soil encountered in our soil borings. All depths given are relative to the ground surface at the time of drilling. Please refer to the boring logs in the Appendix for a more complete description of soil conditions at each boring location.

We are aware that 7 to 8 single family residences previously existed at this site. Our boring data did not find any filled basement excavation areas at the bored locations.

Table 1 on Page 5 is provided after these soil descriptions and contains short summations of the soils within each of the geologic descriptions.

Fill – Fill is soil placed by human activities. About six inches of Portland cement pavement exists at each of the five boring locations. Soil fill was found below the pavement at each boring location except for boring B-5. The fill extends to a depth of about 2 to 4 feet below the top of pavement and consists of firm lean clay. We could not determine when the fill was placed or by whom. This soil exists in a very moist and medium stiff to very stiff condition with the following measured in-place properties:

Water content – 24 to 28%
Dry unit weight – 94 to 100 pcf

Unconfined compressive strength – 1.89 to 2.87 tsf
Passing No. 200 sieve - >95%
Classification (Unified) – Lean Clay (CL)

Weathered Peoria Loess – The weathered surface of the Peoria loess soil was found only at boring B-5 below the pavement. This soil consists of very moist and medium stiff lean clay. A sample of this soil existing with medium plasticity with the following measured in-place properties:

Water content – 31%
Dry unit weight – 86 pcf
Unconfined compressive strength – 0.64 tsf
Passing No. 200 sieve - >95%
Classification (Unified) – Lean Clay (CL)

Peoria Loess – Eolian soil placed as dust by wind during the Wisconsin glacial age exists below the fill and weathered loess at each of the five boring locations. This soil consists of medium to low plasticity lean clay in a moist to very moist and medium stiff to stiff condition with the following measured in-place properties:

Water content – 20 to 31%
Dry unit weight – 89 to 99 pcf
Unconfined compressive strength – 0.55 top 1.99 tsf
Liquid limit – 34 to 44
Plastic limit – 21 to 24
Plasticity index – 12 to 21
Passing No. 200 sieve – >95%
Classification (Unified) – Lean Clay (C)

2.6 Groundwater Data

Groundwater levels should be expected to fluctuate seasonally and yearly from the groundwater readings noted on the boring logs. The evaluator should know the time of year that the borings were drilled and the history of precipitation prior to drilling when extrapolating water levels at other points in time using the groundwater readings from the boring logs. No groundwater level was encountered within a depth of 20 feet below grade at the boring locations at the time of our field work.

Ground surface elevation and groundwater data are listed on Table 2, found on Page 5.

2.7 Seismic Site Class

We understand the area of this project exists within a seismic zone that requires seismic building design per the 2018 International Building Code (IBC). We reviewed the site subsoil conditions in relationship to the criteria set forth in Section 1613.2.2 of the 2018 IBC in conjunction with Chapter 20 of the referenced “Minimum Design Loads for Building and Other Structures (ASCE/SEI 7-16)”, 2016, published by ASCE. A boring to a depth of 100 feet was outside the project scope. Our borings were not advanced to bedrock. Based on the criterial of Chapter 20 of ASCE 7, we have estimated the Seismic Site Class based on experience and the soil conditions found at our boring locations. A Site Class of “D” is defined by this boring data. The project structural engineer shall use this Site Class value in seismic evaluation of the proposed project.

TABLE 1
Subsurface Soil Data

	Soil Layer Description		
	Fill	**Weathered Peoria Loess**	**Peoria Loess**
Found In Borings	B-1 through B-4	B-5	B-1 through B-5
Base Elevation, ft	1639 to 1647	1644	Below Boring Base
Water Content, %	24 to 28	31	20 to 31
Dry Unit Weight, pcf	94 to 100	86	89 to 99
Unconfined Strength, tsf	1.89 to 2.87	0.64	0.55 to 1.99
Atterberg Limits, LL / PL / PI	Not Measured	Not Measured	34-44 / 21-23 / 12-21
Standard Penetration Resistance (N), blows/ft	Not Measured	Not Measured	Not Measured
Passing No. 200 Sieve, %	>95, Estimated	>95, Estimated	>95, Estimated
Classification, Unified System	Lean Clay (CL)	Lean Clay (CL)	Lean Clay (CL)
Descriptors	Moist to Very Moist, Medium Stiff to Very Stiff	Very Moist, Medium Stiff	Moist to Very Moist, Medium Stiff to Stiff

TABLE 2
Boring Elevation and Groundwater Data

Boring Number	Date Drilled	Boring Depth, feet	Ground Surface Elevation	Groundwater Data			
				During Drilling		End of Drilling	
				Depth, ft	Elev., ft	Depth, ft	Elev., ft
B-1	11/30/23	20.0	1646.1	N/A	N/A	N/A	N/A
B-2	11/30/23	20.0	1649.1	N/A	N/A	N/A	N/A
B-3	11/30/23	20.0	1648.0	N/A	N/A	N/A	N/A
B-4	11/30/23	20.0	1643.4	N/A	N/A	N/A	N/A
B-5	11/30/23	20.0	1646.9	N/A	N/A	N/A	N/A

3.0 ENGINEERING RECOMMENDATIONS

3.1 Project Summary

The engineering recommendations made in this Report are based on our understanding of the project as discussed in the following paragraphs. The recommendations are valid for this specific set of project conditions. If the characteristics of the project should change from those indicated in this Section, it is important that this engineer be informed so that we can determine how the new conditions affect our recommendations.

A new fire station structure is proposed within the existing commercial property located northeast of the intersection of East 17th Street and North Lincoln Avenue in York, Nebraska. This new structure will have a total footprint area of about 22,000 square feet and will have a single finished floor level at 1646.50 feet. This new building can be considered as two structures with a common wall. The southern 85 feet of the structure is a residential/office space that is about 180 feet wide by 70 to 85 feet long consisting of a wood frame structure that will contain meeting, storage, kitchen, office rooms, and living quarters. The utility equipment rooms will be housed on a partial second story level above the report office of the main level. The northern 145 feet of the building will be a high ceiling apparatus and equipment storage garage using masonry and steel frame construction and covering an area of about 145 feet by 80 to 95 feet.

Pavements for driveways, parking lots, and truck maneuvering will exist over the east half of the property and between North Lincoln Avenue and the apparatus garage on the west side of the property. I understand that green spaces will be constructed on the edges of the property and around the residential portion of the building. A covered outdoor picnic area will be provided on the east side of the residential building portion.

The project structural engineer provided design loads. Design column loads of up to 50 kips with a maximum wall load of 5.5 kips per lineal foot were provided for the masonry and steel frame construction of the apparatus garage. The office and residential portions of the building will have a slab-on-grade floor supporting a design load of 150 pounds per square foot. Walls of the wood frame residential construction will exert a maximum load of 3 to 4 kips per foot. The apparatus garage and storage area will have a slab-on-grade floor supporting a design load of 250 pounds per square foot. I estimate that a structural control joint will provide structural separation in the east-west direction along the north edge of the storm shelter room, at the location of change from wood frame to masonry and steel frame construction.

The existing alley will be closed. Necessary grading cut to lower the elevation at the north edge of the property will result in construction of a 3-foot high retaining wall at the alley closure point. The gas main will be moved to a new location or relocated to a deeper elevation. The existing sanitary sewer will not be adversely impacted by the proposed construction. Existing overhead power lines will remain. It is possible the overhead power along with the phone and cable utility lines mounted on the power poles will be buried below grade, but this has not been finalized. Up to 4 feet of fill above existing grade will be placed over the area of the residential/office portion of the building. From 1.5 feet of fill to 2.5 feet of cut is required to achieve the finished floor grade of the apparatus garage area. Lesser amounts of cut and fill are required for the pavement area to the east of the new building.

I understand that the finished construction will have less impervious surface area that the existing site configuration. I therefore understand that stormwater detention is not required for the design of this project.

3.2 Site History

The site exists as a big-box retail building will parking lot. A warehouse type structure with driveways and loading dock areas occupies the east half of the site. Portland cement concrete pavement covers the parking lot area over the west half of the site and over all areas surrounding the building within the property. I understand the existing building and parking lot were constructed sometime in the early to mid-1970's. The existing building and parking pavements will be completely removed from the site.

Prior to construction of the big-box store, the site was 10 individual residential lots. The description of the properties was Lots 3 through 12, Block 18 of the New York Addition to the City of York, York County, Nebraska. Historic aerial photographs suggest that four individual single family residences existed on the western five lots. Each home had a detached garage. Historic aerial photographs suggest that three to four individual single family residences existed on the eastern five lots. Each home also had a detached garage. All garages were provided access from the alley that extended in a north-south direction through the center of the block. We estimate that each house had a basement extending 7 to 8 feet below grade.

All the homes were demolished prior to construction of the big-box store. We have no information on the demolitions. It is possible that the demolitions were complete with all debris removed from the site and backfilled with properly compacted clay fill. However, it is equally possible that some debris was buried in the old basement areas and simply covered by some compacted clay fill. Because we have no site data concerning the demolition, we must assume that some debris remains buried below the site until found otherwise. Our proposed site preparation is tailored to determine if buried debris remains.

The existing alley across the center of the site from north to south will be vacated in the area of this project. Existing utilities other than the sanitary sewer main will be relocated or placed to a deeper depth below grade. A soil retaining wall with about 3 feet of unbalanced soil height is required along the north end of the property, from the northwest property corner to across the alley width.

3.3 Geotechnical Overview

This section provides a short, general discussion of what we consider the geotechnical aspects of the site. Each of these items is discussed in greater detail within other sections of this Report.

A new fire station building will be constructed to replace and existing commercial/retail center. We understand the new building will replace the existing parking lot. New building construction will impact the utilities buried below the alley. There is a possibility that the existing overhead power distribution lines within the alley will be relocated underground along with the phone and cable utilities currently supported on the power poles. The gas main will be relocated. New pavement and green spaces will replace the existing warehouse-type structure.

The boring data suggests that the new building can be supported directly by the existing subsoil. However, we found that four houses with detached garages previously existed on the five lots that make up the western half of the property. We understand the houses were demolished sometime prior to construction of the commercial/retail center in the early to mid-1970's. The demolitions were done at separate times over a period of several years. Our experience finds a high probability that some of the building debris was buried onsite. The only conclusive manner to confirm that no deleterious materials remain is to investigate through site overexcavation.

Fill soils, no matter how well they are compacted, do not provide the same support characteristics as firm to stiff natural soils. Floor cracks always develop due to the nonuniform bearing characteristics below floors placed across areas that contain both fill and natural soil subgrade. The only way that we can provide suitable uniformity of a site that partly contains compacted soil fill and partially untouched natural is to overexcavate and place uniformly compacted fill below the entire new structure. Therefore, site preparation shall include overexcavation to a depth of 5 feet and replacement of the excavated soil with compacted clay fill.

The backfill in the areas of the previous houses on the west half of the site shall also be reviewed. The geotechnical engineer or his trained assistant shall be called to the site during the overexcavation to assist in identifying the locations of previous basement backfill areas through review of soil conditions to confirm that all buried debris has been removed and to confirm that the basement areas were properly backfilled.

The previous site construction data when coupled with the proposed building location creates the need to overexcavate the entire new fire station building area. We found no allowance to isolate building portions with structural construction joints to reduce the area of overexcavation.

Below the existing warehouse-type building area, the existing building footings and utilities shall be completely removed to the property lines, or to the tie-ins in the alley. Schemmer shall be required to monitor the removal of the existing structure and existing buried utilities and confirm that all utilities, sand backfill, footings, and all other building and pavement components have been removed.

After site preparation, the soil subgrade below the entire site will be suitable for support of the new building components using normal shallow footings. The soil subgrade after site preparation will provide proper support for the new floor slabs and pavement slabs.

3.4 Building and Site Subgrade Preparation

Heavily organic or root-infested topsoil shall be excavated from the ground surface and be stockpiled for later use in covering the finished landscaped areas after construction. All vegetation shall be stripped from construction areas before soil excavation, before soil fill placement, and before foundation installation. In general, we recommend the removal of topsoil to a depth of 6 inches at this site. Deeper stripping should be done if organic or deleterious materials remain.

Our data suggests that no topsoil is available on site to be stripped. Topsoil placement is required on all disturbed ground surfaces that will not be covered by sidewalks, pavement, or building components. Topsoil will need to be obtained from offsite. We recommend a minimum topsoil thickness of 8 inches at this site.

The existing building and parking light poles will be demolished. Demolition shall include all footings and utility pipes buried below ground. Only wire utilities not placed within conduits can remail below the new construction areas. Existing pavements shall be removed unless specifically shown to remain on the project plans. Other debris may be found to be buried below the site. Miscellaneous debris shall be collected from all construction areas along with the building demolition debris and be properly disposed of offsite in accordance with applicable laws.

Site preparation is required for the building area. Overexcavate to a depth of 5 feet below existing grade or to a depth of 5 feet below the finished floor grade, whichever is deeper. This overexcavation shall extend 5 feet beyond the outer edges of the building components. This building area shall include the signpost on the west side of the building and the handicap ramp along the south edge of the building. This overexcavation does not need to include the generator and transformer pad on the east side of the site. Fill the overexcavation area with properly compacted, structural soil fill in accordance with the requirements of this Report and the project specifications.

Care shall be taken to investigate the filled basement areas existing below the depth of the overexcavation described above for the new building area. If soft fill and/or building debris are

found, these soils shall be overexcavated to the limits of the buried basement areas where encountered.

Overexcavation to a depth of 4 feet shall be completed over the footprint of the existing retail building. Because no building structure will be placed over the east half of the site, we will not require the old house basement areas to be investigated. We do not recommend overexcavation to a depth of 4 feet outside the demolition building area for the rest of the east half of the project area.

After overexcavation is completed, place soil fill to the finished subgrade level of the building and adjoining areas. We understand that a vapor barrier or radon gas collection layer consisting of granular materials might be placed directly below the new floor slabs. A granular layer is required below the floor slab for these layers. Below the apparatus garage floor, I require the granular base layer consist of crushed aggregate. If a radon gas collection system is required see Section 3.11 of this Report for our recommendations.

The finished subgrade of the building and parking areas shall be stable and be able to support loaded construction equipment and trucks without significant deformation. Proper soil materials shall be used to allow truck traffic on the site, as deemed necessary by the specific Contractor. Clean sand does not allow truck traffic. Acceptance of all fill subgrade shall require passing results of soil compaction tests and the proofroll test.

We recommend that a proofroll test be conducted immediately after final placement of soil fill in both the building and parking areas to confirm that the subgrade has sufficient stability. Fill compliance criteria for the parking, driveway, and the building areas shall include both compaction density and proofroll passing results. The contractor shall replace any deficient soil mass and conduct another proofroll test to show that the subgrade has been stabilized if unstable subgrade is noted by the geotechnical engineer or a testing technician during a proofroll test. The proofroll test is described in Section 3.13 of this Report.

If there is a lag in schedule between building area subgrade preparation and building construction of more than four months, the building area shall be subjected to another proofroll test and additional soil compaction density testing on the exposed surface prior to start of building construction.

There is always a potential for the pavement subgrade to be damaged during construction, between fill placement and pavement placement. We recommend the final proofroll test of the pavement subgrade be completed immediately prior to pavement placement. If subgrade damage occurred to cause this final proofroll test to fail, the contractor shall repair the damaged subgrade with new soil compaction density tests and a new proofroll test performed until passing results are achieved.

Our site preparation recommendations consider normal fill placement variation and surface weathering of the existing fill soils. We can take no responsibility for deleterious materials that may have been buried by others or the fill that was placed and tested for compliance by others. Although the procedures outlined above are designed to detect the presence of poor fill or deleterious materials, there is always the risk that some of those deleterious materials may remain below the construction areas. Our exploration detected no deposits of elastic clay or fat clay soil on the site.

In areas of new pavement that are outside the overexcavation limits described in the previous paragraphs, overexcavate the subgrade to a depth of 1 foot below base of pavement. Replace the soil as compacted fill meeting the requirements of compaction density and proofroll test. Overexcavation and fill placement shall extend 2 feet beyond the edges of the pavements.

Table 3 lists our site preparation recommendations.

TABLE 3
Site Preparation Recommendations

	Preparation Notes	
Item Description	**Material Removal**	**Material Reuse**
A. Topsoil Stripping.	Site data find no exposed topsoil onsite.	Cover all disturbed areas outside of pavement, sidewalk and building areas, at least 8" thick. Obtain suitable topsoil from offsite.
B. Remove Debris.	Excavated all debris detected onsite with removal of existing structures or at other locations.	Properly dispose offsite.
C. Building Area Subgrade Preparation. Extend to at least 5 feet outside of outer edges of building walls. Include Signpost on west side of building.	Perform only below the entire building area. Removal all soils, natural and fill, to depth of 5 feet below existing grade or 5 feet below finished floor grade, whichever is deeper. Extend to base of buried house basements, where encountered.	Clean overexcavated soil material can be used as structural fill if it meets the project soil fill specifications. Debris and poor quality fill materials excavated shall be properly disposed offsite.
D. Existing Warehouse Area Subgrade Preparation.	Removal all building and buried utility components to property line or to connections to utilities in alley. Overexcavation preexisting building area to depth of 4 feet below existing grade.	Clean overexcavated soil material can be used as structural fill if it meets the project soil fill specifications. Debris and poor quality fill materials excavated shall be properly disposed offsite.
E. Minimum Pavement Subgrade Preparation. Extend 2 feet outside pavement edges.	Overexcavate subgrade to a depth of 12" (1.0') below base of pavement elevation, unless overexcavated in the steps above on this Table.	Overexcavated material can be used as structural fill if it meets the project soil fill specifications.

Subgrade preparation consisting of overexcavation is not required below new sidewalks. However, the upper 12 inches of subgrade below sidewalks shall be compacted and tested for compliance with the project specifications for structural fill.

We recommend that a technician from Schemmer working under the supervision of the geotechnical engineer be onsite to observe removal of unsuitable materials prior to fill placement and to provide observations and testing during placement of structural fill. This is to verify that our recommendations have been correctly interpreted and to help evaluate compliance with the construction documents. We recommend that a preconstruction meeting be planned prior to the site preparation work to discuss our recommendations and project requirements in relation to the contractor's plan of action. All new fill soils shall be placed with compaction control testing.

No special site preparation is recommended below the generator pad and any other utility pads or pedestals to be constructed outside of the building. The soils at the base of all generator and utility pads shall be compacted to the requirements of structural fill to a depth of at least 12 inches below the base of these reinforced concrete pads. See the requirements of structural fill in Section 3.5 of this Report. We assume that all generator pads or utility pads will be properly reinforced to provide proper rigidity. The reinforced concrete pads will be placed upon the soil subgrade and will not bear below the depth of frost penetration. We understand that small movements associated with frost heave will not adversely affect the performance of equipment supported on these reinforced concrete pads. If small movements will adversely affect the equipment, then the pad shall be supported by footings bearing below frost depth of 3.5 feet.

3.5 Fill Requirements

Excavated topsoil materials and other overexcavated soils that are found to be unsuitable for reuse as compacted fill by the geotechnical engineer shall not be reused in new embankments or as fill below building and pavement areas. Topsoil excavated from the site can be reused as topsoil in landscape areas and the sides of the storm water detention ponds outside new pavement and building areas. If the topsoil contains debris, it shall be properly disposed of offsite. All debris and deleterious materials shall be removed from the site. Excess topsoil shall be removed from the site.

The stripped topsoil is not suitable for use in embankment fill and shall be stockpiled for reuse in covering future vegetated portions of the site after grading activities are completed. Stripped topsoil generally provides greater resistance to water erosion on slopes and provides a better seedbed to grow erosion-resistant plants on slopes and across the entire site. We understand that offsite topsoil will be obtained to place required topsoil on greenspaces of this project.

Clean overexcavated site soil can be reused below the building and pavement areas if it meets the requirements of this Report section. The water content of all soil shall be properly adjusted to a proper level for compaction before it is placed into a proposed fill location. Offsite borrow soil to be used for site structural fill shall meet the requirements of this Report section.

All soil to be used for fill is subject to approval by the geotechnical engineer, including onsite soils. Fills from an offsite borrow sources shall be approved by the geotechnical engineer prior to delivery to the site. Representative samples of the proposed fill and backfill materials should be submitted to the geotechnical engineer at least three days prior to placement so the necessary laboratory tests can be performed.

Material for use as site structural fill should be clean, inorganic, low to medium plasticity lean clay, CL[1], or silt ML[2], or a combination of these materials, with a liquid limit less than 45 and a plasticity

[1] Lean clay, lean clay with sand and sandy clay.
[2] Silt, silt with sand and sandy silt.

index less than 20. We assume the site fills will consist of clean clay or low plasticity silt with less than 20 precent sand content.

Sandy soils with classification of silty sand, SM[3] and clayey sand, SC[4] are not suitable for structural fill at this site. Organic soils with classification OH[5] or OL[6], and highly plastic clays with classification of CH[7] are not approved for general or structure fill at this site. Use of clean sand as a fill is not acceptable at this site, except for special drainage layers and a thin layer below interior floor slab or for MSE wall structural fill. Sandy soils with classification of poorly graded sand, SP[8], poorly graded sand with silt, SP-SM[9], well graded sand, SW[10], well graded sand with silt SW-SM[11], and any gravelly derivatives of these sandy soils are not acceptable for use as structural fill at this site.

We discourage the use of clean sand as a fill at this site, except for special drainage layers or for support of MSE soil retaining walls. We understand that subgrade drainage trenches will not be installed below the exterior pavements. We understand that building footing drains will not be installed. We understand that an MSE soil retaining wall might be constructed on this site.

Soil placed on slopes shall completely consist of structural quality soil fill. Slopes are structural entities and use of poor-quality fill within any portion of a slope and especially at the toe of a slope can initiate a future slope failure, even if the slope will only directly support green space. Compact all slope soil to the requirements of structural fill and then scarify the surface as necessary during seeding or placement of erosion control measures to provide a prepared seedbed.

Cohesive fill soils consisting partially of sand with lean clay and/or silt shall have the proper water content at the time of compaction, within +3% and -3% of optimum water, per ASTM D698-12(2021), Standard Proctor. Water content shall be adjusted to a proper level before the soil is compacted into embankments and as subgrade fill. Crushed aggregate shall be compacted at a water content that does not promote bulking, usually a nearly dry condition.

A granular fill base layer will be placed below all floor slabs. It will not be placed below the exterior pavements or sidewalks. We recommend the use of crushed aggregate consisting of crushed limestone or crushed concrete. Crushed asphalt and river-run gravel are not acceptable. The granular material shall consist of ¾- inch nominal size screened aggregate (less than 5% passing #40 sieve). If ¾-inch nominal size screened aggregate is not locally available, the nominal grain size of the aggregate can be between ¾-inch and 1.5-inch. However, the smallest grain size available within this range is recommended by Schemmer.

All structural quality clay fill should be placed in nearly level lifts, not more than 8-inch loose thickness, after the water content has been manipulated to within the levels stated in the previous paragraphs. Each fill lift must be compacted to the necessary unit weight before additional soil is added. All new structural fill below structures, pavements, sidewalks and in embankments shall

[3] Silty sand.
[4] Clayey sand.
[5] Elastic Silt.
[6] Organic Clay or Organic Silt.
[7] Fat clay, fat clay with sand, and/or sandy fat clay.
[8] Poorly Graded Sand.
[9] Poorly Graded Sand with Silt.
[10] Well Graded Sand.
[11] Well Graded Sand with Silt.

be compacted to not less than 95% of the maximum dry unit weight determined by ASTM D698-12(2021), standard Proctor test.

Compact the upper 12 inches of the floor subgrade for the building and the subgrade below exterior pavement subgrade to at least 98 percent of the maximum dry density determined by ASTM D698-12(2021), standard Proctor test. The granular base placed below the floor slabs and on top of the soil subgrade shall also be compacted to at least 98 percent of the maximum dry density determined by ASTM D698-12(2021), standard Proctor test.

If sand base material is placed below the residential/office portion of the floor slab, it shall have a maximum thickness of 4 inches and shall not be used below the apparatus garage portion of this building. Sand cannot be considered for use as a floor aggregate base layer if a soil gas extraction system is installed. Clean sand from his area will be loosened by foot traffic during preparation for concrete placement and during concrete placement. It shall be compacted to at least 95 percent of the maximum dry density determined by ASTM D698-12(2021), standard Proctor test, but will likely become loose by the time the concrete is placed. We discourage the use of sand subgrade below the floors at this site.

The following Table 4 lists the project soil compaction recommendations.

TABLE 4
Site Compaction Recommendations

Material or Location	Fill and Subgrade Compaction Requirements*	
	Unit Weight*	**Water Contend***
Cohesive Soil Lean Clay and low plasticity Silt.	95% Minimum unless otherwise noted	-3 to +3 from Optimum
Non-Cohesive Soil, Granular Base, Crushed Granular or Sand Base.	98% Minimum unless otherwise noted	Water Content that does not promote Bulking
Elastic Soils Fat Clay and Sandy Fat Clay	Do not use.	N/A
Upper 12 inches of Building and Upper 12 inches of Pavement Subgrade	Silty and/or Clayey Sand, 98% Minimum	-3 to +3 from Optimum
Sidewalks, upper 112 inches	Silty and/or Clayey Sand, 95% Minimum	-3 to +3 from Optimum
Utility Backfill	Silty and/or Clayey Sand, 95% Minimum unless otherwise noted	-3 to +3 from Optimum
Topsoil Replacement	85 to 92% Maximum	According to Material descriptions above

* per Standard Procter Test, ASTM D698-12(2021)

General fill in areas to support vegetation only should be compacted to not less than 85 percent and no more than 92 percent of the maximum dry unit weight determined by ASTM D698-12(2021). Topsoil should not be over compacted. Surface scarification may be required to allow initial root penetration. Tree root balls should not be placed into holes dug into compacted fill but

should be placed on top of the grade with soil mounded around the root ball to allow drainage of excess water from around the roots until the roots can grow into the compacted soil fill.

We understand that erosion control BMP's will be placed to control water erosion from the site. The project design and construction teams must also consider controlling wind erosion dust from this site in this area.

3.6 Backfill

Backfill clay and silt soils placed over utilities and over drainpipes should also be of proper water content during compaction, within -3 to +3% of optimum water, per ASTM D698-12(2021), Standard Proctor. We suggest that thin fill lifts be used, and the trench edges be properly braced or sloped in accordance with OSHA standards. All backfill near or below floor, pavement or foundation elements shall be compacted to at least 95 percent of the maximum dry unit weight determined by ASTM D698-12(2021), Standard Proctor. Be sure to properly consolidate any granular base and be sure to compact the backfill on the sides and top of the new storm sewer to be placed.

Backfill over utility pipes placed in narrow excavations shall be compacted to at least 90 percent of the maximum dry unit weight determined by ASTM D698-12(2021), Standard Proctor. This assumes the utility location has been previously filled to finished subgrade elevation prior to placing the excavated utility. The upper 12 inches of utility backfill below pavements shall be compacted to at least 95 percent of the maximum dry unit weight determined by ASTM D698-12(2021), Standard Proctor. For wide trench excavations, the entire backfill shall be compacted to the requirements of structural fill found in Section 3.5 of this Report.

3.7 Fill-Related Settlement and Site Soil Heave

Placement of soil fill upon any soil subgrade above the level of previous maximum soil surface elevations will cause the subsoils to compress or consolidate under the new weight. New fill and finished floor height of up to 4 feet above existing grade will be placed. The existing clay subgrade will consolidate slowly under the new fill and building loads. Total settlement due to consolidation of up to 2 inches will occur. Due to the variable thickness of new fill above existing grades, differential settlement will occur. We recommend the placement of a temporary surcharge above finished grade over portions of the building area.

Place a temporary surcharge over the residential/office portion of the building. The temporary surcharge shall consist of compacted clay fill having a moist unit weight of at least 115 pounds per cubic foot. However, compacted density of each lift of surcharge does not need to be measured. The surcharge shall have a top elevation of 4.5 feet above finished floor elevation at Elevation 1651.00 feet. This elevation assumes a finished floor elevation of 1646.50 feet. Extend the top of surface a distance of 5 feet beyond the outer edges of the building. The surcharge shall be left in place for a period of 60 days. This top elevation may change if the finished floor level changes. If the finished floor level is different from Elevation 1159.75 in the fill area, the geotechnical engineer shall be hired to review and amend these recommendations.

Soil surcharge is also recommended within the southwest corner of the apparatus garage area, within the triangular area defined as 60 feet north and 50 feet east of the southwest corner of this area. The surcharge shall have a top elevation of 3 feet above finished floor elevation at Elevation 1649.5 feet. Extend this surcharge 5 feet beyond the edges of this area. This surcharge shall be left in place for a period of at least 45 days.

We recommend the installation of four settlement plates to monitor soil consolidation. We suggest the plates consist of buried 4-foot by 4-foot portions of all-weather ¾ inch thick plywood buried at the base of the new fill sections. A rod is then placed to the top of the plywood with a drill rig for monitoring. This installation allows better soil fill compaction uniformity.

Our analyses of the soils on this site finds that the clay subgrade has only a low potential to heave due to changes in soil water content. No elastic silts or clays were encountered. Recommendations to control soil heave are not necessary.

3.8 Foundation Recommendations

Shallow footings are recommended for support of building foundations. Site preparation recommendations are provided above.

3.8.1 Footing Depth, Frost Considerations. Exterior footings and footings adjacent to unheated rooms shall be placed at a depth of at least 42 inches below the lowest adjacent unheated interior grade or at a depth of 42 inches below the exterior grade to inhibit damage from frost action.

Interior footings that exist completely surrounded by heated rooms may be placed at any convenient depth as long as they bear at least 12 inches below the soil subgrade surface below the floor slab system.

Exterior utility and generator pads shall be supported at grade. We understand that this equipment is not adversely affected by temporary slab frost heave.

Structural stoops supported by footings shall be placed at all exterior swinging doors. An expansion joint of sufficient thickness that penetrates the entire pavement thickness shall be placed at all locations where exterior pavements or sidewalks abut building walls or structural stoops. Care shall be used to not allow exterior concrete to extend below siding or other exterior wall coverings.

We suggest a structural stoop be also placed outside overhead doors to inhibit snow melt water from entering the building during winter months because of exterior pavement frost heave. Without a structural stoop extending about 3 to 5 feet outside the overhead doors, snow melt and storm water will typically flow directly into the building if the exterior pavement is temporarily raised due to frost heave.

3.8.2 Foundation Types. Based on the available data, shallow continuous or spread footing foundations are considered suitable for support of proposed new structure loads at this site. This statement assumes the site preparation and other recommendations described in this Report are completed prior to footing installation.

We understand that soil retaining wall will be constructed along the north edge of the site. An unbalanced soil height of up to 3 feet is expected.

3.8.3 Allowable Bearing Pressure. A net allowable soil bearing pressure of 2,500 pounds per square foot is recommended for support of normally constructed shallow building footings on natural soils or on compacted soil fill after overexcavation. Exterior soil retaining walls and exterior utility and generator support slabs and pads shall be designed using a net allowable soil bearing pressure of 1,000 psf.

A factor of safety of 3 against general shear failure was utilized when calculating the soil bearing pressure. Footings shall be excavated into firm natural soils or properly compacted fill with the excavation sides being the forms for the footing concrete.

These recommendations assume the site preparation overexcavation and replacement with compacted soil fill is completed.

After footing excavation, care should be taken to avoid wetting soils exposed at the base of the footings. Footing subgrade should not be allowed to freeze before or after footings are poured. Concrete should not be placed upon wetted soils. If rain or other surface water ponds on the exposed footing base soils, the geotechnical engineer should be notified and be requested to provide suitable recommendations for construction, based on observed conditions at that time.

Conversely, it is also potentially damaging to the building to allow the soil at the base of the footing to dry prior to footing concrete placement. To reduce the potential for excessive wetting or drying of the foundation subgrade, we recommend the lower 8 inches of any footing excavation not be dug until the day the footing concrete will be poured or that the contractor protect the footing subgrade from weather conditions.

Construction during winter weather is a concern for shallow footings within buildings. Protect the subgrade of shallow interior footings placed above a depth of 3.5 feet from frost damage during winter construction until the building is properly heated.

3.8.4 Lateral Earth Pressure. Soil resistance to lateral forces will depend upon the depth of the footing below frost action and other factors that seasonally loosen soils. The following lateral earth pressures, expressed as equivalent fluid pressures without a factor of safety, are recommended in design of foundation walls to support lateral loads:

Passive Resistance	180 pcf
Active Pressure	50 pcf
At-Rest Pressure	65 pcf

Adhesion at the base of the footings supporting lateral load is estimated to be 650 psf. This adhesion value does not include a factor of safety.

The lateral load values provided here do not include water pressure loads. We are aware of no situation that would develop an unbalanced lateral water load below grade at this site.

3.8.5 Excavation Stability. The foundation excavations will generally extend into sandy fills or natural soils. We have no special excavation stability concerns with excavations within properly compacted fill or firm natural soils. However, some of the site soil may become blocky and some sandy soils will not allow vertical excavations without paving. Blocks of soil could fall into the excavations. Clean all loose soil from the excavations before placing concrete. Clean sand fill should not be used, since excavations in clean sand will likely cave.

In any case, conform to the regulations provided by the U.S. Government and OSHA concerning excavation safety, 29 CFR Part 1926, Occupational Safety and Health Standards - Excavations. Our boring data indicated no sand will be encountered within

proposed excavation depths. For the clayey fill expected to be found in the footing excavations at this site, the soil is estimated to generally classify as Type C per 29 CFR Part 1926, Occupational Safety and Health Standards – Excavations. Soil conditions vary and it is necessary for the contractor to have a trained person onsite during construction to determine the actual exposed soil type during excavation, with the authority to properly direct the excavation safety. The geotechnical engineer or any of his staff members is not this person.

3.8.6 Foundation Settlements. After settlement due to the subsoil consolidation caused by fill placement has been stabilized, foundation settlements of less than 1 inch total and less than ½ inch differential in a 30-foot span are estimated under the anticipated building loading, as assumed in this Report, using the net allowable bearing pressure listed above for shallow trench footings and column footings. These values do not include any adverse effects of fill placement above preconstruction grades around the building area during and after construction.

3.8.7 Foundation Excavations. Footing concrete shall be placed in freshly dug excavation trenches. The sides of the trench shall be the form for the footings, or removable forms shall be used if the sides of the trenches cave. Stem walls or column pedestals may extend above the top of footing level.

The site preparation procedures recommended are tailored to uncover major subgrade soil imperfections prior to building construction. However, there is always the potential that some unknown poor foundation support zone could be discovered. It is expected that slight foundation deepening will be the most appropriate method to remove poor foundation support soils at localized areas if such conditions are uncovered.

The contractor shall not place fill in footing trenches to correct over-digs or wrong-footing placement. If the contractor cannot place extra concrete in these cases, the footing area of concern shall be completely filled with structural fill to the floor subgrade level and then dug again.

3.9 Foundation Drains

No exterior foundation drains shall be installed for non-basemented construction. Exterior foundation drains are used to protect a subterranean space such as a basement from inundation and from the application of lateral hydrostatic load on a basement wall or a soil retaining wall. A foundation drain will not reduce the water content at the footing subgrade support level. A foundation drain will only cause more water than necessary to be collected at the footing level of a non-basemented structure.

However, the finished floor grade will be up to 4 feet higher than the exterior grade on the south and west edges of the residential/office portion of the building. An interior foundation wall drain is recommended inside the exterior foundation walls where the difference from interior to exterior grade is 2 feet or greater. No drain shall be placed when the exterior grade is less than 2 feet below the finished floor grade. The base of this interior wall drain shall be 2 inches higher than the exterior grade. Place compacted clay backfill below the base of the interior foundation wall drain.

The suggested interior footing drain system consists of a filter geotextile, Mirafi 140N or approved equal, over the backfilled footing base. The geotextile shall cover the base of the drain and extend

up the sides of the walls from the base to the top of the granular fill, folding over the top of the granular fill. Place a perforated pipe with diameter of 2 to 3 inches upon the geotextile. A filter sock should not be used around this perforated pipe. Cover the drainpipe with at least 12 inches of free-draining and clean granular material such as the granular material consisting of the same granular subgrade material used for the floor slab vapor barrier layer. above the 12 inch thick layer of granular fill, place a prefabricated drainage board material to the top of the soil subgrade below the floor. Compact soil fill above the granular layer and along the drainage board to finished soil subgrade level below the floor.

Provide weep holes through the base of the foundation wall, at a level of about 2 inches above the exterior grade. A minimum of one weep hole is required for each retaining wall face. One weep hole shall be placed at the lowest portion of any wall and at the low points of the exterior grade. Weep holes shall have a maximum spacing interval of 25 feet but shall not be hidden behind stairways of handicap ramps.

A footing drain is required behind all exterior soil retaining walls. The suggested retaining footing drain system consists of a filter geotextile, Mirafi 140N or approved equal, over the backfilled footing base. The geotextile shall cover the base of the drain and extend up the sides of the walls from the base to the top of the granular fill, folding over the top of the granular fill. Place a perforated pipe with diameter of 3 to 4 inches upon the geotextile. A filter sock should not be used around this perforated pipe. Cover the drainpipe with at least 12 inches of free-draining and clean granular material such as the granular material used to construct the working blanket. Extend the compacted granular fill to a level of 12 inches from the surface grade. Wrap the remaining geotextile fabric over the granular material. Backfill the top 12 inches of backfill with properly compacted soil fill for outside retaining walls. If the retaining wall has a pavement above it, be sure to place the pavement above a 12 inch thick layer of clay and pavement subgrade. The soil surface above the exterior retaining walls should be graded to keep water from flowing over the top of the wall.

Provide weep holes through the base of the wall, at a level of about 2 inches above the exterior grade or finished pavement elevation at the low side of the wall. A minimum of one weep hole is required for each retaining wall face. One weep hole shall be placed at the lowest portion of any wall. Weep holes shall have a maximum spacing interval of 20 feet.

Provide rodent resistant screens over all weep holes.

3.10 Grade-Supported Floor Slabs

All new fill soil beneath grade-supported interior floor slabs at this site should be mechanically compacted to at least 95 percent of the maximum dry unit weight of the soil, as determined by ASTM D698-12(2021), standard Proctor test. The upper 12 inches of subgrade shall be compacted to at least 98 percent of the maximum dry unit weight of the soil, as determined by ASTM D698-12(2021), standard Proctor test. The water content of clay soil being compacted should be within -3 and +3 percentage points from the optimum water content, also determined by ASTM D698-12(2021). All building subgrade fill will be placed before footings are installed as part of the site preparation recommendations.

Control of the water content of clayey or silty soil being compacted for subgrade is very important to reduce the potential for floor slab cracking. Although it is sometimes possible to achieve the recommended soil unit weight when compaction is performed at water contents outside of the recommended water content range, the stability of the subgrade will be significantly less if the soil

is compacted when too wet or too dry, potentially resulting in uncontrolled floor slab cracking and panel joint failures.

A sand vapor barrier layer is commonly used below floor slabs. We find that sand in this area is difficult to properly compact and the sand will be loosened by normal foot traffic before and during concrete placement. We recommend that a vapor barrier in the form of a sand layer be used only if necessary. We recommend the sand layer by replaced by a layer of ¾ -inch to 1.5-inch nominal sized crushed Portland cement concrete or crushed limestone that has been screened to remove fines so that only 5 percent passes the No. 4 sieve. If a sand vapor barrier is necessary, we recommend the thickness be limited to 3 inches. A vapor barrier thickness of 4 or more inches may be installed if crushed aggregate is used.

We specify that the vapor barrier below the apparatus garage floor slab consists of crushed aggregate.

Do not allow water to soak into the aggregate base or vapor barrier. I have observed more than one warehouse where the crushed aggregate was allowed to be filled with water. I found that the excess water had remained in the aggregate decades after floor placement, adversely affecting the floor coverings above. Keep the aggregate or sand base material from being inundated with water before concrete floor placement. It this layer becomes wet, remove and replace it.

3.11 Radon Gas Mitigation System

Many of the projects I have been involved with over the past few years have begun to require that radon gas emissions be extracted from below the lower-level floor slabs. Others on the design team will determine if this gas extraction is required for this project. However, I have added this report section to aid the design team. If a radon gas mitigation system is not required, simply disregard this portion of this Report.

The radon gas removal system is a simple soil vapor extraction system. The same granular layer system can be used for radon gas removal, for normal groundwater seepage removal, and as the aggregate base below floors placed to reduce soil moisture diffusion through all floor slabs whether subjected to groundwater inflow or not. The following differences and similarities have been determined:

- A permeable granular base below the slab is required for all types of structures no matter if the building is basemented or not, and no matter if there is groundwater intrusion or not.
- A collector pipe system is required by systems that remove radon and groundwater, typically placed along the perimeter of the building, and at a predetermined spacing below the floor for large footprint structures with:
    - One or more sump pit(s) with pump(s) being required for the groundwater extraction system.
    - One or more air extraction pipe(s) with low volume gas extraction fan(s) and with pipes extending vertically above the floor level being required for the radon gas system.
- According to “The ANSI / AARST (American Association of Radon Scientist and Technologists) CC-1000 2018 Standards, "Soil Gas Control in New Construction of Buildings" the radon gas mitigation system needs to consist of:
    - Minimum 4 inches of granular layer directly below the plastic vapor barrier sheet installed at the base of the Portland cement concrete slab.

- With the granular material consisting of ¾- inch nominal size screened aggregate (less than 5 percent passing #200 sieve).

The system recommended by ANSI /AARST is suitable with a few notes and changes due to materials found in this region of the country.

The following should be noted:

1. The only material in this area that will meet the “gravel” gradation (size) requirement are crushed Portland cement concrete or crushed limestone (There are no other gravels available in this area).

2. If ¾-inch nominal size screened aggregate is not locally available, the nominal grain size of the aggregate can be between ¾-inch and 1.5-inch. However, the smallest grain size available within this range is recommended by Schemmer.

3. We recommend the crushed granular material be screened to have less than 5 percent passing the #40 sieve.

4. If the soil subgrade remains below the gravel layer and water is present (for a basement below the groundwater level), a filter layer needs to be placed on the soil subgrade between the subgrade and the gravel consisting of Mirafi 160N or approved equal. (Must be a needle-punched filter geotextile – “woven geotextiles and grids are not acceptable”). This layer is required to keep the soil from mixing into the open-graded granular material when water is present. (Please note that soil below any and all floor slabs will become very moist or wetter as a natural occurrence, even when the water table exists below the top of the soil subgrade level, in almost all environment conditions except for very arid areas.)

5. If soil subgrade remains well above the normal groundwater level and the floor does not exist in a basement condition, no woven geotextile filter geotextile shall be placed at the base of the aggregate layer.

6. Place the 4-inch-thick crushed stone and pack to firm condition as controlled by the project specifications.

7. Gas and/or water collection pipes shall be placed along the perimeter of the space and at column lines for large spaces. Only radon gas collection will be suitable at this location. We estimate that collection pipes will be necessary only along the perimeter, inside of the foundation walls, of the two building structure types. The pipes shall be 2-inch diameter perforated plastic. The backfill shall be packed to a firm condition.

8. The same gravel bed used for seepage water control should be used for radon gas (frankly all soil gas) control. No need to place two granular fill systems when used in basement floor conditions.

9. Water falls from the perforated pipes to the sump pit(s). Soil gases rise to within the granular bearing layer below the floor.

10. Collected water is pumped from the sump pit. However, no footing drains or sump pit are placed for non-basemented structures.

11. The air is extracted with a gas extraction pipe attached to the top of the buried perforated pipe(s) to remove soil gas. A small fan is usually installed within the extraction pipe to provide a slight vacuum to provide positive soil gas removal through the system and prevent casual escape of gases through the floor slab. For a combined water and soil gas system, I suggest that the builder seal the caps to the tops of each sump pit and attach the gas extraction pipe to the cap of each sump pit. For a system removing only soil gas without groundwater sump pits, I recommend the vertical extraction pipes be placed in inconspicuous locations near exterior walls and the floor slab around these vertical pipes be sealed. Then extend this pipe outside the building to a suitable height above grade. We expect that at least 2 air removal pipes will be installed for the proposed construction.

When I have reviewed gas removal systems by others retrofitted to existing basements (we usually have high radon levels measured in basements and not on floor levels above basements), the only thing the contractor has done is install a perimeter drain tile along the edges of the basement walls. This is the same drain tile used to remove excess groundwater. But instead of installing a sump pit, they install an exhaust pipe with a fan up through the floor and extending outside. No mass floor removal or change in subgrade aggregate is required.

3.12 Surface Drainage and Landscaping

The success of shallow foundations and slab-on-grade floors and pavements at this site is contingent upon keeping the subgrade soils at relatively constant water content, and by not allowing surface drainage a path to the subsurface below structures, below footings, or allow water to pond in aggregate below exterior pavements. We recommend grading to provide positive drainage away from all new building structures. Utility line backfill shall be properly compacted. Irrigation system lines (if installed) should be designed to limit surface water infiltration and introduction of water into soils adjacent to the structures, only to levels necessary to support the desired vegetation. Unregulated irrigation may be done away from buildings. Water lines and sewers should be watertight and tested after installation to reduce the risk of leakage. Leaking pipes shall be promptly repaired.

All features of this site, both interior and exterior, will be supported on a structural quality clay fill or firm natural soils. We expect that irrigation will be necessary to keep surface vegetation green during normal weather conditions.

Temporary grades should be established during construction to prevent runoff from entering excavations. Backfill adjacent to the building and pavements should be placed as soon as concrete structural strength requirements are met and should be graded to drain away from the building and pavements.

Final site grade should provide positive drainage away from buildings. For vegetation-covered areas a minimum gradient of 2.0 percent is recommended within 10 feet of the exterior of buildings. However, the slope may be decreased if the ground surface adjacent to the building is covered with concrete slabs or pavements. A minimum gradient of 0.5 percent is recommended for pavement surfaces next to and around buildings. Pavements and exterior slabs that abut the building should be carefully sealed against moisture intrusion at the joint. We recommend that grass-covered drainage swales also have a minimum gradient of 2.0 percent to allow drainage, especially if the grass is irrigated. Proper placement and compaction of utility and wall trench backfills will reduce unwanted water migration to foundation levels.

Any proposed landscape feature that exists in an area of potential ponding and surrounded by concrete curbs should be separately drained. Perforated pipes and connections to a storm sewer or other gravity drainage should be provided. Any irrigation system should be constructed and operated to prevent accumulation of water ponds near foundation walls.

3.13 Exterior Pavement Recommendations

New pavement will be placed as part of the proposed construction. Subgrade preparation recommendations are provided in Section 3.4 of this Report. Except for dedicated green spaces that are not part of structural slopes, all fills shall be properly compacted to structural fill quality.

Below a depth of 12 inches from the top of the subgrade, compact the soil fill in thin lifts to at least 95% of the maximum dry unit weight of the soil, as determined by ASTM D698-12(2021), standard Proctor test. Compact the upper 12 inches of pavement subgrade in thin lifts to at least 98% of the maximum dry unit weight of the soil, as determined by ASTM D698-12(2021), standard Proctor test as part of final subgrade preparation immediately prior to pavement placement. The water content of clay and silt soil being compacted should be within -2 and +4 percentage points from the optimum water content, also determined by ASTM D698-12(2021).

Schemmer recommends the site pavement subgrade be final prepared with additional surface density compaction testing performed immediately prior to placing the pavement. There is always the potential for rainfall or other inclement weather to occur between fill placement and pavement placement. If the soil surface is wetted by rainfall or disturbed in any way, the affected areas shall be scarified and compacted to the requirements of the previous paragraph.

Immediately prior to paving, the rolling stability of the pavement subgrade shall be evaluated in the presence of the geotechnical engineer or his trained representative through the rolling of a fully loaded tandem axle dump truck over the subgrade. The truck should hold about 10 yards of soil during this proof roll test. As the truck is driven slowly back and forth across the subgrade, the engineer will observe the subgrade deflection and rebound under the loaded tires. If excessive deflection is observed, it is an indication that a portion of the subgrade is too wet or otherwise unstable and that subgrade area will need to be overexcavated and replaced with properly conditioned and compacted subgrade soil fill.

We estimate the prepared subgrade when compacted in accordance with these recommendations will have a pavement modulus of subgrade reaction of about 125 psi/in or a CBR value of about 3. We recommend that the site modulus of subgrade reaction or CBR be evaluated during construction with appropriate laboratory or field testing.

Full-depth pavements and sidewalks supported directly on the compacted soil subgrade shall be used at this site. We recommend that granular fill in the form of a clean and drainable base course not be used below exterior pavements or sidewalks in this area. We understand that drain tile will not be constructed below exterior pavements at this site. Water will not drain from the granular base over the rather flat subgrade surface to be constructed at this site.

Periodic maintenance of pavements should be part of the site maintenance. Water that is allowed to pond on or adjacent to the pavement can saturate and soften the subgrade soils and subsequently accelerate subgrade and pavement deterioration.

We have not been provided with sufficient information to perform an in-depth analysis of the site pavements for thickness. However, based on the normal sizes of equipment as related to proposed subgrade preparation, we recommend the following:

Pavement used for fire apparatus:	9 inches of Portland cement concrete.
Pavement used for automobile parking:	6 inches of Portland cement concrete.

3.14 Additional Considerations

Soil in this area has a moderate potential for heaving due to winter frost action. Depending upon the subsurface moisture available, these soils can heave more than 1 inch during the winter season. Eventual frost heave potential is not significantly altered by degree of soil compaction or degree of available soil moisture. After several winter seasons, previously compacted soil will heave nearly as much as soil of similar type that has not been compacted. Providing efficient and complete drainage of the surface water runoff can decrease frost heave potential by decreasing the amount of water that soaks into the ground and is, therefore, available for future frost heaving. Provide a full-depth expansion joint between exterior pavements and building components to keep frost heave found below the pavement from lifting the adjacent building components.

External slab heaving due to winter frost action can cause serious access problems at exterior swinging doors. Structural stoops with footings placed below the normal frost depth of 42 inches are recommended at all swinging exterior doorways. Frost heave of pavements outside of overhead doors will frequently cause water from snow melt to flow into buildings. Therefore, we suggest that a structural stoop also be placed outside of the overhead doors.

The soil found at this site is typical of the area. Experience indicates that corrosion of buried metallic pipes will occur, and corrosion protection is recommended. Sulfate corrosion potential of Portland cement is generally minimal, and Type I Portland cement is suitable for use. Exterior concrete shall be air-entrained to reduce damage from frost action. If the concrete shall be hard trowel finished, that concrete must have no air entrainment.

4.0 CONSTRUCTION CONSIDERATIONS

All excavation work should be completed in accordance with OSHA standards. Where safe back-slopes cannot be provided, bracing designed by competent professionals should be installed. The results of our subsurface water measurements indicate that dewatering during construction will not be necessary for estimated excavation depths. Surface water runoff shall be diverted away from construction excavations during construction and away from sensitive structures after construction.

5.0 OBSERVATION AND TESTING

Since a project of this nature requires many soil-related judgments and decisions, we recommend that Schemmer be retained as part of the construction team. We recommend that a geotechnical engineer from Schemmer or their trained technician visually inspect all foundation excavations during placement and review all structural steel. We also recommend that a limited number of compaction tests be performed to document the degree of compaction obtained in backfill and structural fill. Fresh concrete shall be tested for compliance with the project specifications.

Schemmer is also available to perform necessary special inspections of building materials by our certified special inspectors and material testing technicians in accordance with the requirements of the building code. We have ICC trained technicians on our staff.

6.0 FIELD EXPLORATION PROCEDURES

6.1 Soil Sampling

The test borings were made with a truck-mounted CME 75 drilling and sampling rig using 4-inch solid stem exterior diameter continuous flight augers to advance the borings in accordance with ASTM D1452-16. Relatively undisturbed samples of cohesive soils were obtained with thin-walled tube samplers (Shelby tubes) in general accordance with ASTM D1587-15. These samples were packaged in appropriate containers and brought to our laboratory. Select samples were evaluated for in-place unit weight and strength.

6.2 Soil Classification

As the samples were obtained in the field, they were visually and manually classified by a geotechnical engineer with Schemmer in general accordance with ASTM D2487-17e1 and D2488-17e1. Representative portions of the samples were then returned to the laboratory for further examination and verification of field classification. Logs of the borings indicating the depth and identification of the various strata, water level information, and pertinent information regarding the method of maintaining and advancing the drill holes are included in the Appendix. Charts illustrating the soil classification procedure are also included in the Appendix.

7.0 STANDARD OF CARE

This Report has been prepared for the exclusive use of our client. The recommendations contained in this Report represent our professional opinions. These opinions were arrived at in accordance with currently accepted engineering procedures at this time and location. Other than this, no warranty, either expressed or implied, is intended.

PROFESSIONAL CIVIL ENGINEER
LORAS A. KLOSTERMANN
E-6498
3/12/2024
STATE OF NEBRASKA

THE SCHEMMER ASSOCIATES INC.

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Nebraska.

Loras A. Klostermann Date: 3/12/2024

Loras A. Klostermann, P.E. No. E-6498

Geotechnical Engineer
My license renewal date is **December 31, 2025.**
Pages or sheets covered by this seal: All pages

APPENDIX

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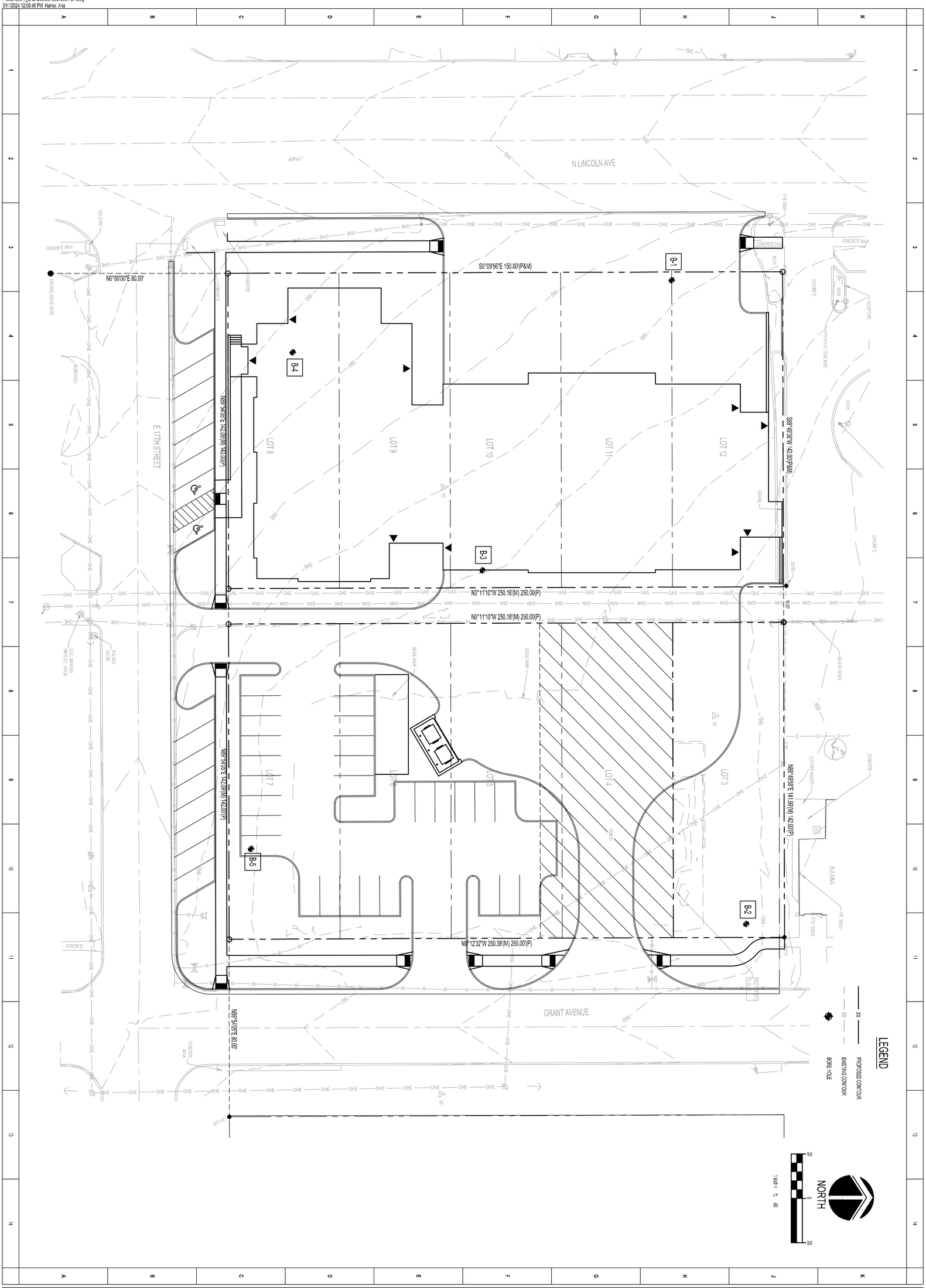

BORING

PROJECT NO.: 09272.001

CITY OF YORK, NE

YORK, NE FIRE STATION

NE CORNER OF E. 17TH STREET AND N LINCOLN

BORING LOCATION PLAN

SCHEMMER

Design with Purpose. Build with Confidence.

1044 N 115TH STREET
SCHEMMER STATE LICENSE & RENEWAL DATE

BORING PLAN

DESIGNED: LAK
DRAWN: APH
CHECKED: LAK

ISSUE DATE: 02/02/2024

REVISIONS:

No.:	DATE:	BY:	DESCRIPTION:

SCHEMMER
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The Schemmer Associates Inc
1044 N 115th Street, Suite 300
Omaha, NE 68154
Telephone: 402-493-4800

BORING NUMBER B-1

CLIENT City of York, Nebraska
PROJECT NAME Fire Station
PROJECT NUMBER 09272.001
PROJECT LOCATION 1714N Lincoln Ave., York, NE
DATE STARTED 11/30/24 **COMPLETED** 11/30/24
GROUND ELEVATION 1645.70 ft USGS **HOLE SIZE** 4 inches
DRILLING CONTRACTOR O'Malley Drilling Inc.
GROUND WATER LEVELS:
DRILLING METHOD 4" OD Continuous Flight Auger
AT TIME OF DRILLING --- None Encountered
LOGGED BY B. Ashcraft **CHECKED BY** L. Klostermann
AT END OF DRILLING --- None Encountered
NOTES
AFTER DRILLING --- Backfilled Immediately

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	WATER CONTENT (%)	DRY UNIT WT. (pcf)	UC STRENGTH (tsf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Pavement, Portland Cement, 6 inches thick											
		(CL) Fill, Lean Clay, medium plasticity, dark brown, very moist, stiff, carbon nodules, ferrous stains, earthy odor	UD 1	56		4.50	26	94					
5		(CL) Peoria Loess, Lean Clay, medium plasticity, gray brown, moist, stiff, carbon nodules, ferrous stains, root holes, few root hairs, earthy odor	UD 2	100		3.50	25	92	1.281	34	22	12	
			UD 3	78		3.50	25						
10			UD 4	67		3.50	25	96	1.493				
		(CL) Peoria Loess, Lean Clay, low plasticity, gray brown, moist to very moist, medium stiff to stiff, carbon nodules, ferrous stains, root holes, earthy odor	UD 5	67		3.50	26						
15													
			UD 6	78		3.00	29	92	0.701				
20		Bottom of borehole at 20.0 feet.											

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Omaha, NE 68154
Telephone: 402-493-4800

BORING NUMBER B-2

CLIENT City of York, Nebraska
PROJECT NAME Fire Station
PROJECT NUMBER 09272.001
PROJECT LOCATION 1714N Lincoln Ave., York, NE
DATE STARTED 11/30/24 **COMPLETED** 11/30/24
GROUND ELEVATION 1648.53 ft USGS **HOLE SIZE** 4 inches
DRILLING CONTRACTOR O'Malley Drilling Inc.
GROUND WATER LEVELS:
DRILLING METHOD 4" OD Continuous Flight Auger
AT TIME OF DRILLING --- None Encountered
LOGGED BY B. Ashcraft **CHECKED BY** L. Klostermann
AT END OF DRILLING --- None Encountered
NOTES
AFTER DRILLING --- Backfilled Immediately

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	WATER CONTENT (%)	DRY UNIT WT. (pcf)	UC STRENGTH (tsf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Pavement, Portland Cement, 6 inches thick											
		(CL) Fill, Lean Clay, medium plasticity, dark gray brown, very moist, medium stiff to stiff, carbon nodules, ferrous stains, earthy odor	UD 1	100		3.50	27	94					
		(CL) Peoria Loess, Lean Clay, medium plasticity, gray brown, moist, stiff, carbon nodules, ferrous stains, root holes, few root hairs, earthy odor											
5			UD 2	100		3.00	24	98	1.642				
			UD 3	78		3.00	25	97	1.37				
10			UD 4	67		3.00							
		(CL) Peoria Loess, Lean Clay, low plasticity, gray brown, moist to very moist, medium stiff to stiff, carbon nodules, ferrous stains, root holes, earthy odor											
15			UD 5	89		3.00	25	92	1.026				
20			UD 6	100		2.50							

Bottom of borehole at 20.0 feet.

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BORING NUMBER B-3

CLIENT City of York, Nebraska
PROJECT NAME Fire Station
PROJECT NUMBER 09272.001
PROJECT LOCATION 1714N Lincoln Ave., York, NE
DATE STARTED 11/30/24 **COMPLETED** 11/30/24
GROUND ELEVATION 1646.98 ft USGS **HOLE SIZE** 4 inches
DRILLING CONTRACTOR O'Malley Drilling Inc.
GROUND WATER LEVELS:
DRILLING METHOD 4" OD Continuous Flight Auger
AT TIME OF DRILLING --- None Encountered
LOGGED BY B. Ashcraft **CHECKED BY** L. Klostermann
AT END OF DRILLING --- None Encountered
NOTES
AFTER DRILLING --- Backfilled Immediately

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	WATER CONTENT (%)	DRY UNIT WT. (pcf)	UC STRENGTH (tsf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Pavement, Portland Cement, 6 inches thick											
		(CL) Fill, Lean Clay, medium plasticity, dark brown, very moist, stiff, carbon nodules, ferrous stains, earthy odor	UD 1	100		4.50	28	95	1.89				
5		(CL) Peoria Loess, Lean Clay, medium plasticity, gray brown, moist, stiff, carbon nodules, ferrous stains, root holes, few root hairs, earthy odor	UD 2	67		4.50	23	95		39	24	15	
			UD 3	56		3.50	22	94	1.826				
10			UD 4	100		4.50	20						
		(CL) Peoria Loess, Lean Clay, low plasticity, gray brown, moist to very moist, medium stiff to stiff, carbon nodules, ferrous stains, root holes, earthy odor											
			UD 5	89		4.50	25	94	1.994				
15													
			UD 6	100		4.50	24	94	1.592				
20		Bottom of borehole at 20.0 feet.											

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Telephone: 402-493-4800

BORING NUMBER B-4

CLIENT City of York, Nebraska
PROJECT NAME Fire Station
PROJECT NUMBER 09272.001
PROJECT LOCATION 1714N Lincoln Ave., York, NE
DATE STARTED 11/30/24 **COMPLETED** 11/30/24
GROUND ELEVATION 1643.40 ft USGS **HOLE SIZE** 4 inches
DRILLING CONTRACTOR O'Malley Drilling Inc.
GROUND WATER LEVELS:
DRILLING METHOD 4" OD Continuous Flight Auger
AT TIME OF DRILLING --- None Encountered
LOGGED BY B. Ashcraft **CHECKED BY** L. Klostermann
AT END OF DRILLING --- None Encountered
NOTES
AFTER DRILLING --- Backfilled Immediately

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	WATER CONTENT (%)	DRY UNIT WT. (pcf)	UC STRENGTH (tsf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Pavement, Portland Cement, 6 inches thick											
		(CL) Fill, Lean Clay, medium plasticity, dark brown, moist, very stiff, carbon nodules, ferrous stains, earthy odor	UD 1	100		3.50	24	100	2.875				
			UD 2	89		4.50	23	96					
5		(CL) Peoria Loess, Lean Clay, medium plasticity, gray brown, moist, stiff, carbon nodules, ferrous stains, root holes, few root hairs, earthy odor	UD 3	100		3.50	24	95	1.508				
			UD 4	100		3.50	23	89	1.241	35	21	14	
10													
		(CL) Peoria Loess, Lean Clay, low plasticity, gray brown, moist to very moist, medium stiff to stiff, carbon nodules, ferrous stains, root holes, earthy odor	UD 5	100		3.50	24	89	0.637				
15													
			UD 6	78		2.00	30	89	0.554				
20		Bottom of borehole at 20.0 feet.											

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Omaha, NE 68154
Telephone: 402-493-4800

BORING NUMBER B-5

CLIENT City of York, Nebraska
PROJECT NAME Fire Station
PROJECT NUMBER 09272.001
PROJECT LOCATION 1714N Lincoln Ave., York, NE
DATE STARTED 11/30/24 **COMPLETED** 11/30/24
GROUND ELEVATION 1346.89 ft USGS **HOLE SIZE** 4 inches
DRILLING CONTRACTOR O'Malley Drilling Inc.
GROUND WATER LEVELS:
DRILLING METHOD 4" OD Continuous Flight Auger
AT TIME OF DRILLING --- None Encountered
LOGGED BY B. Ashcraft **CHECKED BY** L. Klostermann
AT END OF DRILLING --- None Encountered
NOTES
AFTER DRILLING --- Backfilled Immediately

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	WATER CONTENT (%)	DRY UNIT WT. (pcf)	UC STRENGTH (tsf)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Pavement, Portland Cement, 6 inches thick											
		(CL) Weathered Peoria Loess, Lean Clay, medium plasticity, very dark gray brown, very moist, medium stiff, carbon nodules, ferrous stains, mealy, root holes, root hairs, earthy odor	UD 1	100		3.50	31	86	0.64				
		(CL) Peoria Loess, Lean Clay, medium plasticity, gray brown, moist, stiff, carbon nodules, ferrous stains, root holes, few root hairs, earthy odor	UD 2	56		3.50	25	98					
5			UD 3	67		3.50	26	99	1.317	44	23	21	
			UD 4	100		3.50	27						
10		(CL) Peoria Loess, Lean Clay, low plasticity, gray brown, moist to very moist, medium stiff to stiff, carbon nodules, ferrous stains, root holes, earthy odor	UD 5	100		3.50	31	91	1.118				
15			UD 6	67		3.50	30						
20		Bottom of borehole at 20.0 feet.											

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GEOTECHNICAL ENGINEERING DIVISION

SUMMARY OF SOIL TEST RESULTS

PROJECT: Fire Station

JOB NUMBER: 09272.001

CLIENT: City of York, Nebraska

DATE: 12/28/2023

LOCATION: 1714 North Lincoln Avenue, York, Nebraska

BORING No.	SAMPLE NO.	SAMPLE DEPTH (ft.)	SAMPLE DIAM. (in.)	SAMPLE LENGTH (in.)	WATER CONTENT (%)	UNIT WT. WET (pcf)	UNIT WT. DRY (pcf)	VOID RATIO (e)	SAT. (%)	UNCONFINED COMPRESSION q_u (tsf)	UNCONFINED COMPRESSION STRAIN (€, %)	SOIL CLASSIFICATION ATTERBERG LIMITS LL	PL	PI	PASSING #200 (%)	SYMBOL	REMARKS
B-1	UD-1	1-2.5'	2.728	3.9	26.3	118.7	94.0	0.78	90								
	UD-2	3.5-5'	2.732	5.8	24.5	115.0	92.4	0.81	81	1.281	6.15	34	22	12	>95	CL	Lean Clay
	UD-3	6-7.5'			25.2												
	UD-4	8.5-10'	2.832	5.7	24.6	119.6	96.0	0.74	89	1.493	5.28						
	UD-5	13.5-15'			25.9												
	UD-6	18.5-20'	2.786	5.7	29.0	118.3	91.7	0.82	94	0.701	5.21						
B-2	UD-1	1-2.5'	2.810	4.2	27.3	119.4	93.8	0.78	93								
	UD-2	3.5-5'	2.824	4.4	23.9	121.4	98.0	0.71	91	1.642	6.79						
	UD-3	6-7.5'	2.750	5.0	24.5	121.3	97.4	0.72	92	1.370	6.78						
	UD-4	8.5-10'															
	UD-5	13.5-15'	2.800	4.9	25.0	115.0	92.0	0.82	82	1.026	4.62						
	UD-6	18.5-20'															
B-3	UD-1	1-2.5'	2.733	5.8	27.8	121.4	94.9	0.76	98	1.890	7.22						
	UD-2	3.5-5'	2.852	2.7	22.5	116.8	95.3	0.76	80			39	24	15	>95	CL	Lean Clay
	UD-3	6-7.5'	2.812	4.1	21.7	114.8	94.3	0.77	75	1.826	5.12						
	UD-4	8.5-10'			19.5												
	UD-5	13.5-15'	2.859	5.7	24.7	116.7	93.6	0.79	84	1.994	5.91						
	UD-6	18.5-20'	2.862	5.2	24.2	116.7	94.0	0.78	83	1.592	11.64						
B-4	UD-1	1-2.5'	2.853	5.7	24.0	124.6	100.4	0.67	97	2.875	13.86						
	UD-2	3.5-5'	2.852	5.5	23.1	118.4	96.2	0.74	84								
	UD-3	6-7.5'	2.845	5.1	23.8	117.0	94.5	0.77	83	1.508	4.38						
	UD-4	8.5-10'	2.835	4.6	23.4	110.1	89.2	0.88	72	1.241	3.20	35	21	14	>95	CL	Lean Clay
	UD-5	13.5-15'	2.796	4.5	24.3	110.5	88.9	0.88	74	0.637	1.10						
	UD-6	18.5-20'	2.803	5.7	29.9	115.9	89.2	0.88	91	0.554	9.46						

Moisture Content by ASTM D2216, Unconfined Compression by ASTM D2166, Atterberg Limits by ASTM D4318, Classification by ASTM D2487

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GEOTECHNICAL ENGINEERING DIVISION

SUMMARY OF SOIL TEST RESULTS

PROJECT: Fire Station

JOB NUMBER: 09272.001

CLIENT: City of York, Nebraska

DATE: 12/28/23

LOCATION: 1714 North Lincoln Avenue, York, Nebraska

BORING No.	SAMPLE NO.	SAMPLE DEPTH (ft.)	SAMPLE DIAM. (in.)	SAMPLE LENGTH (in.)	MOISTURE CONTENT (%)	DENSITY WET (pcf)	DENSITY DRY (pcf)	VOID RATIO (e)	SAT. (%)	UNCONFINED COMPRESSION q_u (tsf)	UNCONFINED COMPRESSION STRAIN (€, %)	SOIL CLASSIFICATION ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	PASSING #200 (%)	SYMBOL	REMARKS
B-5	UD-1	1-2.5'	2.699	5.8	31.3	113.0	86.1	0.94	89	0.640	11.52						
	UD-2	3.5-5'	2.832	5.0	24.8	121.8	97.6	0.72	93								
	UD-3	6-7.5'	2.385	4.4	26.0	124.3	98.7	0.70	100	1.317	11.19	44	23	21	>95	CL	Lean Clay
	UD-4	8.5-10'			26.9												
	UD-5	13.5-15'	2.745	5.7	30.5	119.2	91.4	0.83	98	1.118	5.34						
	UD-6	18.5-20'			30.2												

Moisture Content by ASTM D2216, Unconfined Compression by ASTM D2166, Atterberg Limits by ASTM D4318, Classification by ASTM D2487

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

(Based on Unified Soil Classification System)

ASTM: D 2487

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML of MH	GM	Silty gravel[F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel[F, G, H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	SW	Well-graded sand
			$Cu < 6$ and/or $1 > Cc > 3$[E]	SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G, H, I]
			Fines classify as CL or CH	SC	Clayey sand[G, H, I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K, L, M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K, L, M]
		Organic	Liquid limit -- oven dried / Liquid limit -- not dried < 0.75	OL	Organic clay[K, L, M, N] / Organic silt[K, L, M, O]
	Silts and Clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line	CH	Fat clay[K, L, M]
			PI plots below "A" line	MH	Elastic silt[K, L, M]
		Organic	Liquid limit -- oven dried / Liquid limit -- not dried < 0.75	OH	Organic clay[K, L, M, P] / Organic silt[K, L, M, Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to the group name.

[C] Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains $\geq$ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains $\geq$ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

[L] If soil contains $\geq$ 30% plus No. 200, predominantly sand, add "sandy" to group name.

[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI $\geq$ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

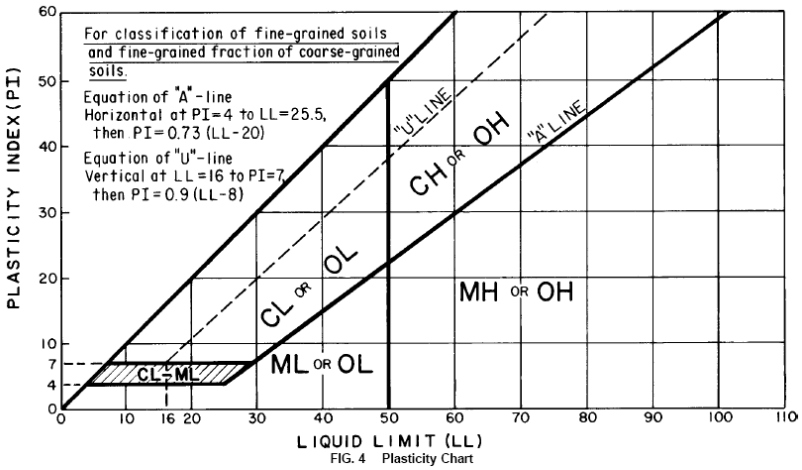
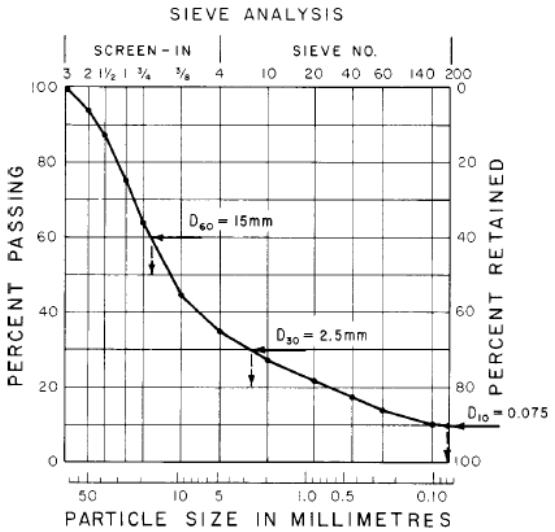


FIG. 4 Plasticity Chart



$Cu = \frac{D_{60}}{D_{10}} = \frac{15}{0.075} = 200$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = \frac{(2.5)^2}{0.075 \times 15} = 5.6$

FIG. 5 Cumulative Particle-Size Plot

GENERAL NOTES

DRILLING AND SAMPLING SYMBOLS

SS : Split-Barrel - 2" O.D., Unless Otherwise Noted
UD : Thin-Walled Tube - 3" O.D., Unless Otherwise Noted
GB : Bag Sample - From Cutting, Unless Otherwise Noted
T : Test Pit Grab Sample
REC : Sample Recovery, Percent
NSR : No Sample Recovered
NMR : No Measurement Recorded, Due to Drilling Fluid
NONE : No Groundwater Level Encountered Within Drilling Depth
MOIST : Moisture Condition
CONS : Consistency
SOIL CLASS: Soil Classification per ASTM D 2487, Unless Otherwise Noted (Unified System Symbols)
Fish : Fish Tail Drilling Bit
CFA : Continuous Flight Auger
HSA : Hollow Stem Auger

ADDITIONAL SYMBOLS

Pq : Penetrometer Reading - tons per square foot
Ts : Torvane Reading - tons per square foot
SPG : Specific Gravity (ASTM D 854)
SHL : Shrinkage Limit (ASTM D 427)
OC : Organic Content
pH : Hydrogen Ion Content
SC : Sulfate Ion Content - Parts/Million or mg/L
CC : Chloride Ion Content- Parts/Million or mg/L
C* : One-Dimensional Consolidation (ASTM D 2435)
Qc* : Triaxial Compression
DS* : Direct Shear (ASTM D 3080)
K* : Coefficient of Permeability - cm/sec
LR : Laboratory Resistivity - Ohm-cm (ASTM G 57)
RQD : Rock Quality Designation - Percent
* See attached data sheet or graph, if used.

SOIL DESCRIPTION ABBREVIATIONS

med. : Medium, as in Medium Stiff or Medium Dense
sl. : Slightly, as in Slightly Moist

TEST SYMBOLS

MC : Moisture Content - % of Dry Soil Weight (ASTM D 2216)
SAT. : Saturation of Sample - %
q_u : Unconfined Compressive Strength (ASTM D 2166)
STRAIN : Strain at Maximum Strength (ASTM D 2166)
LL : Liquid Limit (ASTM D 4318)
PL : Plastic Limit (ASTM D 4318)
PI : Plasticity Index (ASTM 4318)
PASSING No. 200 : Passing No. 200 Sieve (ASTM D 422)
▽ : Groundwater Level Measurement

Notes:

1. Standard "N" Penetration (ASTM D 1586): Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch OD split-barrel sampler.

2. Water levels shown on the boring logs are the levels measured in the borings at the time and under the conditions indicated. In pervious soils, the indicated levels may reflect the location of the groundwater. In low permeability soils, the accurate determination of the groundwater levels is not possible with only short term observations. Please note that groundwater levels vary with time and location.

CONSISTENCY OF COHESIVE SOILS (CLAY)

Unconfined Compressive Strength, qu (tsf)	Consistency	N - blows / foot
< 0.25	Very Soft	< 2
0.25 - 0.50	Soft	2 - 4
0.50 - 1.00	Medium Stiff	5 - 8
1.00 - 2.00	Stiff	9 - 15
2.00 - 4.00	Very Stiff	16 - 30
> 4.00	Hard	> 30

RELATIVE DENSITY OF GRANULAR SOILS (SILT AND SAND)

N - blows / foot	Relative Density
0 - 3	Very Loose
4 - 9	Loose
10 - 29	Medium Dense
30 - 50	Dense
> 50	Very Dense

RELATIVE PARTICLE SIZES

Description	Sieve Size	
Boulder	> 12"	(+ 300 mm)
Cobble	3" - 12"	(75 mm - 300 mm)
Gravel		
Coarse	3/4" - 3"	(19 mm - 75 mm)
Fine	#4 - 3/4"	(4.75 mm - 19.0 mm)
Sand		
Coarse	#10 - #4	(2.0 mm - 4.75 mm)
Medium	#40 - #10	(0.425 mm - 2.0 mm)
Fine	#200 - #40	(0.075 mm - 0.425 mm)
Silt and Clay	Passes #200	(- 0.075 mm)

Classification as Silt or Clay Based on Plasticity

TERMINOLOGY DEFINITIONS

Dry	Powdery, No apparent moisture
Slightly Moist	Can feel moisture, but soil won't retain shape when remolded
Moist	Can feel moisture, Will remold easily, yet crumbles upon kneading
Very Moist	Can feel much moisture, Molds easily and does not crumble when kneaded
Wet	Saturated, Above liquid limit moisture content
Water-Bearing	Pervious soil below water level

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SECTION 00-4113 – BID FORM

1.01 BID INFORMATION

A. Bidder: _____.

B. Address: _____

C. City, State, Zip: _____

D. Telephone: _____

E. E-Mail:_____

F. Project Name: York Fire Station No. 1

G. Project Description: New Fire Station

H. Project Location: 1714 N. Lincoln Avenue, York, NE 68467

I. Owner: City of York

J. Coordinating Professional: Dan Kerns, AIA, NCARB - Schemmer

1.02 CERTIFICATIONS

A. The undersigned bidder does hereby declare and stipulate that this bid is made in good faith, without collusion or connection with any other person or persons proposing for the same work, and that it is made in pursuance of and subject to all the terms and conditions of the advertisements, proposal requirements, the proposed construction contract, and the contract documents, including the plans pertaining to the work to be done, all of which have been examined by the undersigned. The undersigned hereby declares that they have visited the site, have had sufficient time to make all tests and investigations to arrive at an intelligent estimate of the cost of doing the work, and has carefully examined the plans, specifications, and contract documents relating to the work covered by their bid, and that they agree to do the work, and that no representation made by the owner are in any sense a warranty, but are mere estimates for guidance of the contractor.

B. The undersigned further agrees that they will provide all necessary tools and apparatus, do all work, furnish all materials, and do everything required to carry out the work covered by this proposal, in strict accordance with the contract documents, and the requirements pertaining thereto, for the sum of sums set forth.

C. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by BRW Architects and the Architect's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents,

D. This is a lump sum proposal. The prices in the lump sum proposal shall include all labor, equipment, materials, services, transportation, shoring, removal, de-watering, overhead, profit, insurance, bonding, etc., to cover the completed work in place.

E. The construction allowance item shall only be used at the discretion of the owner. It is intended to provide a means of payment for specific unanticipated or unforeseen work items for which no pay item is provided. Generally, these items will be minor in nature, are within the scope of the project, and comply with the intent of the plans and contract documents, however no specific pay item exists as a means of compensation to the contractor. No

portion of the construction allowance shall be paid to the contractor nor shall any extra work be performed by the contractor without authorization from the owner. The owner shall retain all construction allowance monies not used by the owner during the construction of the project.

1.03 BASE PROPOSAL

A.

Base Proposal for the Stipulated Lump Sum of	$	
Owner's Contingency Allowance	$	500,000.00
Base Proposal + Owner's Contingency Allowance	$ _____	

Dollars

1.04 ACKNOWLEDGEMENT OF ADDENDA

A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:
   1. Addendum No. 1, dated _____.
   2. Addendum No. 2, dated _____.
   3. Addendum No. 3, dated _____.
   4. Addendum No. 4, dated _____.

1.05 BID SUPPLEMENTS

A. The following supplements are a part of this Bid Form and are attached hereto.
   1. Bid Form Supplement - Unit Prices, Specification Division 00 43 22 Section
   2. Bid Form Supplement – Alternates Form, Specification Division 00 43 23 Section
   3. Bid Form Supplement - Bid Bond Form (AIA Document A310-2010).

1.06 BID GUARANTEE

A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 60 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5 percent of the Base Bid amount above:
   1. _____ Dollars ($_____).

B. In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the cash, cashier's check, certified check, U.S. money order, or bid bond.

1.07 PERFORMANCE AND PAYMENT BONDS:

A. Within ten days, the contractor will deliver the Contract and Performance and Payment Bonds as required in the specifications. The name and address of the corporate surety with which the proposer proposes to furnish the specific Performance and Payment bond is to accompany this Bid in the form of AIA document A310-2010 fully executed and sealed.

1.08 TIME OF COMPLETION

A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Architect and shall fully complete the Work within 500 calendar days.

B. The issuance of a Notice to Proceed (NTP) requires the undersigned to commence work under this contract not later than ten (10) days thereafter and to complete such work in the overall time and construction phases described in Specification Division 01 10 00 Section Summary.

Proposer shall indicate if they accept the specified construction duration or may show below a shorter duration period:

_____Calendar Days

C. **LIQUIDATED DAMAGES:** The time of completion is the essence of this contract. For each calendar day that any work shall remain uncompleted after the time specified in the bid and the contract, or the increased time granted by the Owner, or as equitably increased by additional work or materials ordered after the contract is signed, the sum of **$500** per calendar day, unless otherwise specified in the special provisions, shall be deducted from the monies due the Contractor. The sum of money thus deducted for such delay, failure or noncompletion is not to be considered as a penalty, but shall be deemed, taken and treated as reasonable liquidated damages, per calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work. The said amounts are fixed and agreed upon by and between Owner and Contractor because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner in such event would sustain; and said amounts are agreed to be the amount of damages which the Owner would sustain and which shall be retained from the monies due, or that may become due, the Contractor under this contract; and if said monies be insufficient to cover the amount owing, then the Contractor or their surety shall pay any additional amounts due.

1.09 CONTRACTOR'S LICENSE

A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in Nebraska and that all fees, permits, etc., pursuant to submitting this bid have been paid in full.

1.10 SUBMISSION OF BID

A. Respectfully submitted this ____ day of _____, 2024.

B. Submitted By:_____

(Name of bidding firm or corporation).

C. Authorized Signature:_____

(Handwritten signature).

D. Signed By:_____

(Type or print name).

E. Title:_____

F. Witnessed By:_____

(Handwritten signature).

G. By:_____

(Type or print name).

H. Title:_____

I. Street Address:_____.

J. City, State, Zip:_____.

K. Phone:_____.

L. License No.:_____.

END OF DOCUMENT 00 41 13

SECTION 00-4322 – UNIT PRICES FORM

1.01 BID INFORMATION

A. Bidder: _____.

B. Project Name: York Fire Station

C. Project Description: New Fire Station

D. Project Location: 1714 N. Lincoln Avenue, York, NE 68467

E. Owner: City of York

F. Architect: Dan Kerns, AIA, NCARB - Schemmer

1.02 BID FORM SUPPLEMENT

A. This form is required to be attached to the Bid Form.

B. If the unit price does not affect the Work of this Contract, the Bidder shall indicate "NOT APPLICABLE."

1.03 UNIT PRICES

A. Unit-Price No. 1: Removal of unsatisfactory soil and replacement with structural fill material.
   1. _____ dollars ($_____) per unit.

B. Unit-Price No. 2: New concrete paving.
   1. _____ dollars ($_____) per unit.

C. Unit-Price No. 3: New Concrete sidewalk.
   1. _____ dollars ($_____) per unit.

D. Unit-Price No. 4: New concrete curb and gutter.
   1. _____ dollars ($_____) per unit.

1.04 SUBMISSION OF BID SUPPLEMENT

A. Respectfully submitted this ____ day of _____, 2024.

B. Submitted By:_____

   (Insert name of bidding firm or corporation).

C. Authorized Signature:_____

   (Handwritten signature).

D. Signed By:_____

   (Type or print name).

E. Title:_____

END OF DOCUMENT 00 43 22

SECTION 00-4323 – ALTERNATES FORM

1.01 BID INFORMATION

A. Bidder: _____.

B. Project Name: York Fire Station

C. Project Description: New Fire Station

D. Project Location: 1714 N. Lincoln Avenue, York, NE 68467

E. Owner: City of York

F. Architect: Dan Kerns, AIA, NCARB - Schemmer

1.02 BID FORM SUPPLEMENT

A. This form is required to be attached to the Bid Form.

1.03 DESCRIPTION

A. The undersigned Bidder proposes the amount below be added to or deducted from the Base Bid if particular alternates are accepted by Owner. Amounts listed for each alternate include costs of related coordination, modification, or adjustment.

B. If the alternate does not affect the Contract Sum, the Bidder shall indicate "NO CHANGE."

C. If the alternate does not affect the Work of this Contract, the Bidder shall indicate "NOT APPLICABLE."

D. The Bidder shall be responsible for determining from the Contract Documents the affects of each alternate on the Contract Time and the Contract Sum.

E. Owner reserves the right to accept or reject any alternate, in any order, and to award or amend the Contract accordingly within 60 days of the Notice of Award unless otherwise indicated in the Contract Documents.

F. Acceptance or non-acceptance of any alternates by the Owner shall have no affect on the Contract Time unless the "Schedule of Alternates" Article below provides a formatted space for the adjustment of the Contract Time.

1.04 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Revise roofing material to be standing seam metal roof and accessories. See Specification Section 07-4113.16 Standing-Seam Metal Roof Panels (Alternate).
   1. ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.
   2. _____ Dollars ($_____).

B. Alternate No. 2: Contractor to Provide Builder’s Risk Insurance in lieu of the Owner.
   1. ADD____ DEDUCT____ NO CHANGE____ NOT APPLICABLE____.
   2. _____ Dollars ($_____).

1.05 SUBMISSION OF BID SUPPLEMENT

A. Respectfully submitted this ____ day of _____, 2024.

B. Submitted By:_____

(Insert name of bidding firm or corporation).

C. Authorized Signature:_____

(Handwritten signature).

D. Signed By:_____

(Type or print name).

E. Title:_____

(Owner/Partner/President/Vice President).

END OF DOCUMENT 00 43 23

SECTION 00-6000 – PROJECT FORMS

1.01 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor Agreement shall be used for Project:
   1. AIA Document A101-2017 Stipulated Sum: "Standard Form of Agreement between Owner and Contractor Where the Basis of Payment is a Stipulated Sum."
      a. The General Conditions for Project are AIA Document A201-2017 "General Conditions of the Contract for Construction."
   2. The General Conditions, AIA Document A201 Latest edition, is included in the Project Manual.

1.02 ADMINISTRATIVE FORMS

A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

B. Copies of AIA standard forms may be obtained from the American Institute of Architects; www.aiacontractdocsaiacontracts.org; (800) 942-7732.

C. Preconstruction Forms:
   1. Form of Performance Bond and Labor and Material Bond: AIA Document A312-2010 "Performance Bond and Payment Bond."
   2. Form of Certificate of Insurance: AIA Document G715-2017 "Supplemental Attachment for ACORD Certificate of Insurance 25."

D. Information and Modification Forms:
   1. Form for Requests for Information (RFIs): AIA Document G716-2004 "Request for Information (RFI)."
   2. Form of Request for Proposal: AIA Document G709-2018 "Proposal Request."
   3. Change Order Form: AIA Document G701-2017 "Change Order."
   4. Form of Architect's Memorandum for Minor Changes in the Work: AIA Document G710-2017 "Architect's Supplemental Instructions."
   5. Form of Change Directive: AIA Document G714-2017 "Construction Change Directive."

E. Payment Forms:
   1. Schedule of Values Form: AIA Document G703-1992 "Continuation Sheet."
   2. Payment Application: AIA Document G702-1992/703-1992 "Application and Certificate for Payment and Continuation Sheet."
   3. Form of Contractor's Affidavit: AIA Document G706-1994 "Contractor's Affidavit of Payment of Debts and Claims."
   4. Form of Affidavit of Release of Liens: AIA Document G706A-1994 "Contractor's Affidavit of Payment of Release of Liens."
   5. Form of Consent of Surety: AIA Document G707-1994 "Consent of Surety to Final Payment."

END OF SECTION 00 60 00

DRAFT

AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

and the Contractor:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

«»
«»
«»

The Architect:
(Name, legal status, address and other information)

« »« »
« »
« »
« »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[X] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[X] Not later than five-hundred (500) calendar days from the date of commencement of the Work.

[ ] By the following date: « »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

§ 4.5.1 The time of completion is the essence of this contract. For each calendar day that any work shall remain uncompleted after the time specified in the bid and the contract, or the increased time granted by the Owner, or as equitably increased by additional work or materials ordered after the contract is signed, the sum of **$500** per calendar day, unless otherwise specified in the special provisions, shall be deducted from the monies due the Contractor. The sum of money thus deducted for such delay, failure or noncompletion is not to be considered as a penalty, but shall be deemed, taken and treated as reasonable liquidated damages, per calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work. The said amounts are fixed and agreed upon by and between Owner and Contractor because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner in such event would sustain; and said amounts are agreed to be the amount of damages which the Owner would sustain and which shall be retained from the monies due, or that may become due, the Contractor under

this contract; and if said monies be insufficient to cover the amount owing, then the Contractor or their surety shall pay any additional amounts due.

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due: 10%.

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

« »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

« »

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[X] Litigation in a court of competent jurisdiction , York County, Nebraska..

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*

DRAFT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

09285.001 Grand Island Fire Station No. 3

THE OWNER:
(Name, legal status and address)

« »« »
« »

THE ARCHITECT:
(Name, legal status and address)

« »« »
« »

TABLE OF ARTICLES

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the

Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed

alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide

notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.
§ 3.8.1.1 The City reserves the right to not allow a subcontractor. The City will need to review the list of subcontractors and approve them prior to the contract being signed.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to

completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste

materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or

for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract

Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone. Change Orders over 5% of the contract price must be approved by Council prior to any work being done.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the

various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment;

or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 A payment bond is required by the City. No liens can be filed against government owned property, so the bond is a requirement in the full amount of the bid.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any claim for payment by any Subcontractor or supplier of any tier. No liens can be filed against government owned property and are not allowed by statute.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance,

heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such claim, security interest, or encumbrance. If a claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall file against the payment bond.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or

polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established

under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- **.1** damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- **.2** damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on

the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to resolution in a Court of competent jurisdiction.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

AIA® Document A305™ – 2020

Contractor's Qualification Statement

THE PARTIES SHOULD EXECUTE A SEPARATE CONFIDENTIALITY AGREEMENT IF THEY INTEND FOR ANY OF THE INFORMATION IN THIS A305-2020 TO BE HELD CONFIDENTIAL.

SUBMITTED BY:
(Organization name and address.)

SUBMITTED TO:
(Organization name and address.)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

TYPE OF WORK TYPICALLY PERFORMED
(Indicate the type of work your organization typically performs, such as general contracting, construction manager as constructor services, HVAC contracting, electrical contracting, plumbing contracting, or other.)

THIS CONTRACTOR'S QUALIFICATION STATEMENT INCLUDES THE FOLLOWING:
(Check all that apply.)

- ☐ Exhibit A – General Information
- ☐ Exhibit B – Financial and Performance Information
- ☐ Exhibit C – Project-Specific Information
- ☐ Exhibit D – Past Project Experience
- ☐ Exhibit E – Past Project Experience (Continued)

CONTRACTOR CERTIFICATION
The undersigned certifies under oath that the information provided in this Contractor's Qualification Statement is true and sufficiently complete so as not to be misleading.

_____ _____
Organization's Authorized Representative Signature **Date**

_____
Printed Name and Title

NOTARY
State of:
County of:
Signed and sworn to before me this day of

_____
Notary Signature

My commission expires:

Init.
/

AIA® Document A305™ – 2020 Exhibit A

General Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by
and dated the day of in the year
(In words, indicate day, month and year.)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

§ A.1 ORGANIZATION
§ A.1.1 Name and Location
§ A.1.1.1 Identify the full legal name of your organization.

§ A.1.1.2 List all other names under which your organization currently does business and, for each name, identify jurisdictions in which it is registered to do business under that trade name.

§ A.1.1.3 List all prior names under which your organization has operated and, for each name, indicate the date range and jurisdiction in which it was used.

§ A.1.1.4 Identify the address of your organization's principal place of business and list all office locations out of which your organization conducts business. If your organization has multiple offices, you may attach an exhibit or refer to a website.

§ A.1.2 Legal Status
§ A.1.2.1 Identify the legal status under which your organization does business, such as sole proprietorship, partnership, corporation, limited liability corporation, joint venture, or other.

.1 If your organization is a corporation, identify the state in which it is incorporated, the date of incorporation, and its four highest-ranking corporate officers and their titles, as applicable.

.2 If your organization is a partnership, identify its partners and its date of organization.

.3 If your organization is individually owned, identify its owner and date of organization.

.4 If the form of your organization is other than those listed above, describe it and identify its individual leaders:

§ A.1.2.2 Does your organization own, in whole or in part, any other construction-related businesses? If so, identify and describe those businesses and specify percentage of ownership.

§ A.1.3 Other Information

§ A.1.3.1 How many years has your organization been in business?

§ A.1.3.2 How many full-time employees work for your organization?

§ A.1.3.3 List your North American Industry Classification System (NAICS) codes and titles. Specify which is your primary NAICS code.

§ A.1.3.4 Indicate whether your organization is certified as a governmentally recognized special business class, such as a minority business enterprise, woman business enterprise, service disabled veteran owned small business, woman owned small business, small business in a HUBZone, or a small disadvantaged business in the 8(a) Business Development Program. For each, identify the certifying authority and indicate jurisdictions to which such certification applies.

§ A.2 EXPERIENCE

§ A.2.1 Complete Exhibit D to describe up to four projects, either completed or in progress, that are representative of your organization's experience and capabilities.

§ A.2.2 State your organization's total dollar value of work currently under contract.

§ A.2.3 Of the amount stated in Section A.2.2, state the dollar value of work that remains to be completed:

§ A.2.4 State your organization's average annual dollar value of construction work performed during the last five years.

§ A.3 CAPABILITIES

§ A.3.1 List the categories of work that your organization typically self-performs.

§ A.3.2 Identify qualities, accreditations, services, skills, or personnel that you believe differentiate your organization from others.

§ A.3.3 Does your organization provide design collaboration or pre-construction services? If so, describe those services.

§ A.3.4 Does your organization use building information modeling (BIM)? If so, describe how your organization uses BIM and identify BIM software that your organization regularly uses.

§ A.3.5 Does your organization use a project management information system? If so, identify that system.

§ A.4 REFERENCES

§ A.4.1 Identify three client references:
(Insert name, organization, and contact information)

§ A.4.2 Identify three architect references:
(Insert name, organization, and contact information)

§ A.4.3 Identify one bank reference:
(Insert name, organization, and contact information)

§ A.4.4 Identify three subcontractor or other trade references:
(Insert name, organization, and contact information)

SECTION 01-1000 – SUMMARY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Project information.
      a. Project Identification
   2. Owner Information
      a. Architect Information
      b. Architect's Consultants
   3. Web-Based Software
   4. Contractor's Duties
   5. Weather Days
   6. Work covered by Contract Documents.
   7. Phased construction.
   8. Work performed by Owner..
   9. Future work not part of this Project.
   10. Owner-furnished/Contractor-installed (OFCI) products.
   11. Owner-furnished/Owner-installed (OFOI) products.
   12. Contractor's use of site and premises.
   13. Coordination with occupants.
   14. Work restrictions.
   15. Specification and Drawing conventions.

B. Related Requirements:
   1. Division Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
   2. Division Section 01 73 00 "Execution" for coordination of Owner-installed products.

1.03 PROJECT INFORMATION

A. Project Identification: York Fire Station
   1. Project Location: 1714 N. Lincoln Avenue, York, NE 68467

B. Owner: City of York, 100 East 4th Street, York, NE 68467
   1. Owner's Representative: Dr. Sue Crawford, City Administrator

C. Coordinating Professional: Schemmer, 1045 N. 115th St, #300, Omaha, NE 68154
   1. Representative: Dan Kerns, AIA, NCARB
      402-493-4800, dkerns@schemmer.com

D. Coordinating Professional’s Consultants: The Coordinating Professional has retained the following design professionals, who have prepared designated portions of the Contract Documents:
   Architect of Record: BRW Architects, 175 Century Square Drive, Suite 350, College Station, TX 77840
   a. Architect Representative: Marcus Gibbon, AIA, NCARB, mgibbon@brwarch.com

2. Civil Engineer: Schemmer, 1045 N. 115th St, #300, Omaha, NE 68154
    a. Civil Engineer Representative: Matthew Hubel, PE, CPSWQ, LEED AP BD+C, mhubel@schemmer.com
3. Structural Engineer: Schemmer, 1045 N. 115th St, #300, Omaha, NE 68154
    a. Structural Engineer Representative: Joshua Pearce, PE, jpearce@schemmer.com
4. Mechanical/Electrical/Plumbing Engineer: Schemmer, 1045 N. 115th St, #300, Omaha, NE 68154
    a. Mechanical/Electrical/Plumbing Engineer Representative: Jeff Kulhanek, PE, jkulhanek@schemmer.com
    b. Electrical Representative: Joe Binge, PE, jbinge@schemmer.com

E. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.
1. See Division Section 01 31 00 "Project Management and Coordination." for requirements for using web-based Project software.

1.04 CONTRACTOR'S DUTIES

A. Furnish and provide for proper execution and completion of work as required by the Contract Documents all:
1. Labor, materials and equipment.
2. Tools, construction equipment and machinery.
3. Water, heat and utilities required for construction.
4. Other facilities and services necessary for proper execution and completion of the work.

B. Attain and pay for required permits, licenses, and government fees unless indicated otherwise.
1. Owner will pay for the Building Permit fee.
2. Unless specifically indicated otherwise, Contractor is responsible to hire and pay for all third party reviews and inspections required by authorities having jurisdiction.
    a. Architect on behalf of the owner, will retain and pay for handicap accessibility inspection required. Coordinate scheduling with Architect to coincide with or to follow after substantial completion.

C. Give required notices.

D. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of work.

E. Promptly submit written notice to Architect of observed variance of Contract Documents from legal requirements. It is not Contractor's responsibility to make certain that drawings and specifications comply with codes and regulations.

F. Contractor shall verify all conditions at the site and dimensions in the field prior to starting work. Architect shall be notified in writing of any discrepancies found.

G. The Drawing and Specifications represent the work to be completed not the method of construction. However, the Contractor shall perform all demolition and remedial work in a sequence to where any interruption of the operation of the facilities or utility service occurs at an absolute minimum.

H. Contractor shall use every precaution to prevent damage to roads, landscape, adjacent property, building and utilities above and below ground that are adjacent to or included in the area under contract. The Contractor shall repair and replace, at their expense, any material or building affected, damaged or destroyed because of their operations or work.

I. Safety Requirements: The Contractor has full responsibility for the safety of workers and for all damages to personal property caused by its operations. The Contractor is responsible for following all Federal, State, and Local Regulations and Guidelines with regards to worker and public safety. Unless otherwise indicated on the proposal, the necessary tools, equipment,

procedures, etc. for following the appropriate regulations and guidelines will be considered subsidiary to other proposal items.

1.05 WEATHER DAYS

A. The Contractor may be granted an extension of time because of abnormal inclement weather conditions. Contractor shall submit reports on monthly intervals indicating the rainfall and temperature on inclement weather days to document for each month the days in excess of normal inclement weather conditions that may contribute to future time extension requests.
   1. Provide reports each month whether the Contractor believes at that time that time extension will be necessary. In months not exceeding normal inclement weather days and for which additional time will not be requested, reports need not be provided.
   2. Available float shall be used before any request is made for time extension due to inclement weather.

B. For this contract, "abnormal inclement weather" will be interpreted as the occurrence of one or more of the following conditions within a twenty-four (24) hour day that prevents construction activity exposed to weather conditions or access to the site and shall include Drying days:
   1. Precipitation (rain, snow, or ice) in excess of one-tenth inch (0.10") liquid measure.
   2. Temperatures that do not rise above that required for the day's construction activity if such temperature requirement is specified or accepted as standard industry practice.
   3. Sustained wind in excess of twenty-five (25) m.p.h.

C. Weather Conditions: The information in the Standard Baseline table for average climatic range reflects data available from the National Oceanic and Amospheric Administration (NOAA) at the nearest available weather data collection station to the project site, as an average over the past 30 years.

D. Standard Baseline is defined as the normal number of calendar days for each month during which construction activity exposed to weather conditions is expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.

E. Standard Baseline (including Drying days) is as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
8	8	10	12	13	12	10	9	8	9	8	8

F. All claims for additional time shall be limited to time extensions only. Except as may be specifically provided for in the Owner-Construction Manager Agreement, claims for additional costs due to time extensions shall not be considered.

1.06 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

   Project consists of new construction of a 23,400 sf fire station and fire administrative building for the City of York Nebraska. The project will be located at the intersection of Lincoln Avenue and E. 17th Street and will extend to N. Grant Avenue taking the place of the current Road 6 Customs property.

   The seven bay fire station has sleeping accommodation for seven, a kitchen, dining and day room, fitness area, bathrooms, and apparatus bay support spaces. The administrative functions for the building include offices, conference / lounge spaces, training room and public restrooms. Located on the second floor are the mechanical, electrical, and IT rooms

The wood and CMU framed structure has support steel to assist in carrying loads and an ICC-500 storm shelter. Exterior materials are brick and fiber cementitious siding with composition shingles.

B. Type of Contract:
   1. Project will be constructed under a single prime contract.

1.07 WORK PERFORMED BY OWNER

A. Cooperate fully with Owner, so work may be carried out smoothly, without interfering with or delaying Work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be substantially complete before Work under this Contract begins.
   1. Relocation of furnishings and other Owner's items prior to demolition start, will be performed by Owner's personnel or under separate contract prior to demolition start. Coordinate scheduling of these activities with Owner.

C. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract.
   1. Audio Visual wiring and equipment installation.
   2. Security System and Security Camera System wiring and equipment installation.
   3. Phased relocation of furnishings and other Owner's items will be performed by Owner's personnel or under separate concurrent contract.

D. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory Work under this Contract.
   1. Furniture, fixtures and equipment installation.

1.08 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
   1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
   2. Provide for delivery of Owner-furnished products to Project site.
   3. Upon delivery, inspect, with Contractor present, delivered items.
      a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
   4. Obtain manufacturer's inspections, service, and warranties.
   5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:
   1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
   2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
   3. Receive, unload, handle, store, protect, and install Owner-furnished products.
   4. Make building services connections for Owner-furnished products.
   5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
   6. Repair or replace Owner-furnished products damaged following receipt.

1.09 OWNER-FURNISHED/OWNER-INSTALLED (OFOI) PRODUCTS

A. The Owner will furnish and install products indicated.

1.10 CONTRACTOR'S USE OF SITE AND PREMISES

A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
      a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.11 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
   2. Provide not less than 72 hours notice to Owner of activities that will affect Owner's operations.
   3. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
   4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.12 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
   2. Comply with work hour and noise restriction requirements of local authorities, if such exist.

B. On-Site Work Hours: Contractor to coordinate work hours with owner.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
   1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.
   2. Obtain Architect's written permission before proceeding with utility interruptions.

D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
   1. Notify Architect and Owner not less than two days in advance of proposed disruptive operations.
   2. Obtain Architect's written permission before proceeding with disruptive operations.

E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.

F. Smoking and Controlled Substance Restrictions: Use of tobacco products , alcoholic beverages, and other controlled substances on Project site is not permitted.

G. Deliveries: Schedule deliveries during times acceptable to Owner, and outside of times of peak street traffic and peak activities per Owner's operational schedule.

1.13 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
   3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
   4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard.
   3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01-2500 – SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.
   1. Substitutions for Cause
   2. Substitutions for Convenience

B. Related Requirements:
   1. Division Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
   2. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.03 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
      a. Contractor's failure to consider and confirm lead time, or to order materials, in time to avoid construction schedule impact, does not constitute a substitution for cause.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.04 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use form that is part of web-based Project management software.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
      b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
   b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.05 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.06 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.07 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution is consistent with the Contract Documents and will produce indicated results including aesthetic intent. The architect will be the sole determiner of product or system compliance with the aesthetic design intent
      b. Substitution request is fully documented and properly submitted.
      c. Requested substitution will not adversely affect Contractor's construction schedule.
      d. Requested substitution has received necessary approvals of authorities having jurisdiction.

e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01-2600 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation

1.02 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:
   1. Division 01 Section - Unit Prices for administrative requirements for using unit prices.
   2. Division Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
   3. Division Section 01 3 100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.03 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

1.04 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
   2. Within 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
      e. Quotation Form: Use AIA Document G709 or form provided as part of web-based Project management software.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use AIA DocumentG709 or form provided as part of web-based Project management software.

1.05 ADMINISTRATIVE CHANGE ORDERS

A. Unit-Price Adjustment: See Division Section 01 22 00 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.06 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701 or provided as part of web-based Project management software.

1.07 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 or form provided as part of web-based Project management software. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01-2900 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Division Section 01 22 00 "Unit Prices" for administrative requirements governing the use of unit prices.
   2. Division Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   3. Division Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.03 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.04 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
      a. Contractor's Construction Schedule
      b. Submittal Schedule.
      c. Application for Payment forms with continuation sheets.
   2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
   3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the schedule of values:
      a. Project name and location.
      b. Owner's name.
      c. Name of Architect.
      d. Architect's Project number.
      e. Contractor's name and address.
      f. Date of submittal.
   2. Arrange schedule of values consistent with format of AIA Document G703.

3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
    a. Related Specification Section or division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
        1) Labor.
        2) Materials.
        3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
    a. Include separate line items under **Contractor and** principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    a. Temporary facilities and other major overhead cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
9. Schedule of Values Revisions: Revise and resubmit the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.05 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
    1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
    1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:
   a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
   b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
   c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt[within 24 hours]. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
2. If approved by Owner, submit electronic transmission of Pay Application, in lieu of paper copies.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment or subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Sustainable design action plans, including preliminary project materials cost data.
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.

9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Report of preconstruction conference.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
      a. Complete administrative actions, submittals, and Work preceding this application, as described in Division Section 01 77 00 "Closeout Procedures."
   2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Certification of completion of final punch list items.
   3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   4. Updated final statement, accounting for final changes to the Contract Sum.
   5. AIA Document G706.
   6. AIA Document G706A.
   7. AIA Document G707.
   8. Evidence that claims have been settled.
   9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
   10. Final liquidated damages settlement statement.
   11. Proof that taxes, fees, and similar obligations are paid.
   12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01-3100 – PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Conservation.
   3. Correlation of Documents.
   4. Coordination drawings.
   5. Requests for Information (RFIs).
   6. Project Web site.
   7. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
   1. Division 01 Section - Multiple Contract Summary for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
   2. Division 01 Section - Construction Progress Documentation for preparing and submitting Contractor's construction schedule.
   3. Division 01 Section - Execution for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   4. Division 01 Section - Closeout Procedures for coordinating closeout of the Contract.
   5. Division 01 Section - General Commissioning Requirements for coordinating the Work with Owner's Commissioning Authority.

1.03 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.04 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, and telephone number of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.

3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room, in temporary field office, on Project Web site, and by each temporary telephone. Keep list current at all times.

1.05 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Preinstallation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.06 CORRELATION OF DOCUMENTS

A. Any discrepancy in the documents shall be interpreted to include the most restrictive or costly solution. In case of discrepancy either in figures or Drawings or Specifications, the matter must be promptly submitted by the Contractor to the Architect, who will promptly make a determination in writing. Any adjustment by the Contractor without such a determination by the Architect will be at the Contractor's own risk and expense. The Architect will furnish, as necessary, additional detailed Drawings and information for clarification.
B. If a document discrepancy is identified prior to bidding, the Architect is to be notified so a written clarification may be issued.
C. Any survey drawing documents included herein are for convenience of the Contractor and Owner. The Architect assumes no responsibility as to their completeness or accuracy.
D. Anything mentioned in the Specifications and not shown on the Drawings, or shown on the Drawings and not mentioned in the Specifications, is of like effect as if shown or mentioned in both.
E. On any of the Drawings in which a portion of the work is detailed or drawn out and the remainder is shown in outline, the parts detailed or drawn out will apply also to all other like portions of the work.
F. When the word "similar" appears on Drawings, it has a general meaning and must not be interpreted as meaning identical. All details must be worked out in relation to their location and connection with other parts of the work.
G. Refer to Architectural Drawings for verification of locations, sizes and dimensions.

1.07 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
    1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
        a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
        b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
        c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
        d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
        e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
        f. Indicate required installation sequences.
        g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Refer to Division 23 Section - Basic Mechanical Materials and Methods and Division 26 Section - Basic Electrical Materials and Methods for specific Coordination Drawing requirements for mechanical and electrical installations.
7. Mechanical and Plumbing Work: Work to be shown shall include, but not be limited to the following:
    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.
8. Electrical Work: Work to be shown shall include, but not be limited to the following:
    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.
9. Fire-Protection System: Work to be shown shall include, but not be limited to the following:
    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
10. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
11. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Division 01 Section - Submittal Procedures.
12. Staff Names: Submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site with the bid proposal. Within 15 days of starting construction operations, identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
13. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone

C. Coordination of Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Preparation Format: DWG, Version 2013, operating in Microsoft Windows operating system.
3. File Submittal Format: Submit or post coordination drawing files using Portable Data File (PDF) format.
4. Architect may consent to furnish Contractor with one set of digital data files of certain drawings for use in preparing coordination digital data files, subject to Contractor's acceptance of Architect's terms. Architect's consultants may or may not agree to provide digital data files, or may have additional terms for release of their files.
    a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    b. Digital Data Software Program: Drawings are available in AutoCad and Revit and PDF file format, latest version.
    c. Contractor shall sign a data licensing agreement form in a format acceptable to Architect, as a pre-condition for release of Architect's files.

1.08 REQUESTS FOR INFORMATION (RFI'S)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
    1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
    2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
    1. Project name.
    2. Project number.
    3. Date.
    4. Name of Contractor.
    5. Name of Architect.
    6. RFI number, numbered sequentially.
    7. RFI subject.
    8. Specification Section number and title and related paragraphs, as appropriate.
    9. Drawing number and detail references, as appropriate.
    10. Field dimensions and conditions, as appropriate.
    11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
    12. Contractor's signature.
    13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
        a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
    1. Attachments shall be electronic files in Adobe Acrobat PDF format.
D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
    1. The following Contractor-generated RFIs will be returned without action:
        a. Requests for approval of submittals.
        b. Requests for approval of substitutions.

c. Requests for approval of Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section - Contract Modification Procedures.
   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Use software log that is part of Project Web site. Software log with not less than the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.09 PROJECT WEB SITE

A. Provide, administer, and use Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:
1. Project directory.
2. Project correspondence.
3. Meeting minutes.
4. Contract modifications forms and logs.
5. RFI forms and logs.
6. Task and issue management.
7. Photo documentation.
8. Schedule and calendar management.
9. Submittals forms and logs.
10. Payment application forms.
11. Drawing and specification document hosting, viewing, and updating.
12. Online document collaboration.
13. Reminder and tracking functions.
14. Archiving functions.

B. Provide up to 15 Project Web site user licenses for use of the Owner, Construction Manager, Architect, and Architect's consultants. Provide eight hours of software training at Architect's office for Project Web site users.

C. On completion of Project, provide one complete archive copy of Project Web site files to Owner and to Architect in a digital storage format acceptable to Architect.

D. Provide one of the following Project Web site software packages under their current published licensing agreements:
   1. Autodesk, Constructware.
   2. Meridian Systems, Prolog and ProjectTalk.
   3. ProCore
E. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of AIA Document C106.

1.10 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
      e. Lines of communications.
      f. Procedures for processing field decisions and Change Orders.
      g. Procedures for RFIs.
      h. Procedures for testing and inspecting.
      i. Procedures for processing Applications for Payment.
      j. Distribution of the Contract Documents.
      k. Submittal procedures.
      l. Preparation of record documents.
      m. Use of the premises.
      n. Work restrictions.
      o. Working hours.
      p. Owner's occupancy requirements.
      q. Responsibility for temporary facilities and controls.
      r. Procedures for moisture and mold control.
      s. Procedures for disruptions and shutdowns.
      t. Construction waste management and recycling.
      u. Parking availability.
      v. Office, work, and storage areas.
      w. Equipment deliveries and priorities.
      x. First aid.
      y. Security.
      z. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
   1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, and Owner's Commissioning Authority of scheduled meeting dates.
   2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
      a. Contract Documents.
      b. Options.
      c. Related RFIs.
      d. Related Change Orders.
      e. Purchases.
      f. Deliveries.
      g. Submittals.
      h. Review of mockups.
      i. Possible conflicts.
      j. Compatibility requirements.
      k. Time schedules.
      l. Weather limitations.
      m. Manufacturer's written instructions.
      n. Warranty requirements.
      o. Compatibility of materials.
      p. Acceptability of substrates.
      q. Temporary facilities and controls.
      r. Space and access limitations.
      s. Regulations of authorities having jurisdiction.
      t. Testing and inspecting requirements.
      u. Installation procedures.
      v. Coordination with other work.
      w. Required performance results.
      x. Protection of adjacent work.
      y. Protection of construction and personnel.
   3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
   4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
   5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
   1. Conduct the conference to review requirements and responsibilities related to Project closeout.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
   3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of record documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for preparing operations and maintenance data.
e. Requirements for delivery of material samples, attic stock, and spare parts.
f. Requirements for demonstration and training.
g. Preparation of Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Coordination of separate contracts.
k. Owner's partial occupancy requirements.
l. Installation of Owner's furniture, fixtures, and equipment.
m. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at monthly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
1) Review schedule for next period.
b. Review present and future needs of each entity present, including the following:
1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site utilization.
9) Temporary facilities and controls.
10) Progress cleaning.
11) Quality and work standards.
12) Status of correction of deficient items.
13) Field observations.
14) Review recording of changes on record field set.
15) Safety
16) Work hours
17) Status of RFIs.
18) Status of proposal requests.
19) Pending changes.

20) Status of Change Orders.
21) Pending claims and disputes.
22) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

F. Coordination Meetings: Conduct Project coordination meetings at monthly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
   1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
      a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
      c. Review present and future needs of each contractor present, including the following:
         1) Interface requirements.
         2) Sequence of operations.
         3) Resolution of BIM component conflicts.
         4) Status of submittals.
         5) Deliveries.
         6) Off-site fabrication.
         7) Access.
         8) Site utilization.
         9) Temporary facilities and controls.
         10) Work hours.
         11) Hazards and risks.
         12) Progress cleaning.
         13) Quality and work standards.
         14) Change Orders.
   3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION 01 31 00

01-3200 – CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Startup construction schedule.
   2. Contractor's construction schedule.
   3. Submittals schedule
   4. Construction schedule updating reports.
   5. Daily construction reports.
   6. Material location reports.
   7. Site condition reports.
   8. As-Built documentation.
   9. Special reports.
   10. Construction photographs.
B. Related Requirements:
   1. Division 01 Section - Payment Procedures for submitting the Schedule of Values.
   2. Division 01 Section - Project Management and Coordination for submitting and distributing meeting and conference minutes.
   3. Division 01 Section - Submittal Procedures for submitting schedules and reports.
   4. Division 01 Section - Quality Requirements for submitting a schedule of tests and inspections.
   5. Division 01 Section - Closeout Procedures for submitting photographic negatives as Project Record Documents at Project closeout.

1.03 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.
B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.
C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
E. Event: The starting or ending point of an activity.
F. Float: The measure of leeway in starting and completing an activity.
    1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
    2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
    3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.04 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
    1. Working electronic copy of schedule file, where indicated.
    2. PDF electronic file.
B. Startup construction schedule.
    1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
    1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
    1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
    2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
    3. Total Float Report: List of all activities sorted in ascending order of total float.
    4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
F. Construction Schedule Updating Reports: Submit with Applications for Payment.
G. Construction Photographs: Submit two prints of each photographic view with Application for Payment.
    1. Format: 4 x 6 smooth-surface prints on single-weight commercial-grade paper, enclosed in clear plastic sleeves that are punched for standard 3-ring binder.
    2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:
        a. Name of Project.
        b. Name and address of photographer.
        c. Name of Architect.
        d. Name of Contractor.
        e. Date photograph was taken.

f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

3. Submit a complete set of photographs on CD as a Project Record Document. Identify date photographs were taken.

H. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

I. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
   1. Scheduled date for first submittal.
   2. Specification Section number and title.
   3. Submittal category (action or informational).
   4. Name of subcontractor.
   5. Description of the Work covered.
   6. Scheduled date for Architect's final release or approval.

J. Daily Construction Reports: Submit at monthly intervals.

K. Material Location Reports: Submit at monthly intervals.

L. Site Condition Reports: Submit at time of discovery of differing conditions.

M. Special Reports: Submit at time of unusual event.

1.05 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section - Project Management and Coordination. Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:
   1. Review software limitations and content and format for reports.
   2. Verify availability of qualified personnel needed to develop and update schedule.
   3. Discuss constraints, including phasing and interim milestones.
   4. Review delivery dates for Owner-furnished products.
   5. Review schedule for work of Owner's separate contracts.
   6. Review submittal requirements and procedures.
   7. Review time required for review of submittals and resubmittals.
   8. Review requirements for tests and inspections by independent testing and inspecting agencies.
   9. Review time required for Project closeout and Owner startup procedures.
   10. Review and finalize list of construction activities to be included in schedule.
   11. Review procedures for updating schedule.

1.06 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.01 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
   1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
   2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
      a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
   2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section - Submittal Procedures in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
   5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
   6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Phasing: Arrange list of activities on schedule by phase.
   2. Work under More Than One Contract: Include a separate activity for each contract.
   3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
   4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section - Summary. Delivery dates indicated stipulate the earliest possible delivery date.

5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section - Summary. Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:
    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.
7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    a. Subcontract awards.
    b. Submittals.
    c. Purchases.
    d. Mockups.
    e. Fabrication.
    f. Sample testing.
    g. Deliveries.
    h. Installation.
    i. Tests and inspections.
    j. Adjusting.
    k. Curing.
8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
    a. Structural completion.
    b. Temporary enclosure and space conditioning.
    c. Permanent space enclosure.
    d. Completion of mechanical installation.
    e. Completion of electrical installation.
    f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones:
1. Temporary enclosure and space conditioning.

E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
1. See Division 01 Section - Payment Procedures for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate

changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
   1. Use Microsoft Project for Windows 10 system.

2.03 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within 10 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.04 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
   1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.05 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice of Award. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
   1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
      a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
   2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
   3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
   4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
   1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
      a. Preparation and processing of submittals.

b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing.
j. Punch list and final completion.
k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
   a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
   b. Total cost assigned to activities shall equal the total Contract Sum.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
   1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
   2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
   3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
   4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
      a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
      b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.06 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. List of separate contractors at Project site.
   3. Approximate count of personnel at Project site.
   4. Equipment at Project site.
   5. Material deliveries.
   6. High and low temperatures and general weather conditions, including presence of rain or snow.
   7. Accidents.
   8. Meetings and significant decisions.
   9. Unusual events (see special reports).
   10. Stoppages, delays, shortages, and losses.
   11. Meter readings and similar recordings.
   12. Emergency procedures.
   13. Orders and requests of authorities having jurisdiction.
   14. Change Orders received and implemented.
   15. Construction Change Directives received and implemented.
   16. Services connected and disconnected.
   17. Equipment or system tests and startups.
   18. Partial completions and occupancies.
   19. Substantial Completions authorized.
B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
   1. Material stored prior to previous report and remaining in storage.
   2. Material stored prior to previous report and since removed from storage and installed.
   3. Material stored following previous report and remaining in storage.
C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.07 AS-BUILT DOCUMENTATION

A. Contractor shall record changes to the Construction Documents where the constructed work deviates from that which is shown. This “As-Built” documentation shall be recorded in “Red” on a dedicated field set at the trailer.

2.08 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

A. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable. Events include, but are not limited to:
   1. Safety / injury events.
   2. Security / theft / law enforcement events.
   3. Events involving news media coverage.

PART 3 - EXECUTION

3.01 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

   1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.

   2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

   3. As the Work progresses, indicate final completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

   1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.02 CONSTRUCTION PHOTOGRAPHS

A. Format: digital, 4 x 6 prints.

B. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

C. Preconstruction Photographs: Before starting construction, take twelve color photographs of Project site and surrounding properties from different vantage points, as directed by Architect. Show existing conditions adjacent to property.

D. Periodic Construction Photographs: Take twelve color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.

1. Field Office Prints: Retain one set of prints of periodic photographs in field office at Project site, available at all times for reference. Identify photographs the same as for those submitted to Architect.

2. Provide two (2) sets of photographs to Architect with each Application for Payment.

E. Final Completion Construction Photographs: Take twelve color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.

END OF SECTION 01 32 00

SECTION 01-3300 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
B. Related Requirements:
   1. Division 01 Section - Payment Procedures for submitting Applications for Payment and the schedule of values.
   2. Division 01 Section - Project Management and Coordination for submitting Coordination Drawings.
   3. Division 01 Section - Construction Progress Documentation for submitting schedules and reports, including Contractor's construction schedule.
   4. Division 01 Section - Operation and Maintenance Data for submitting operation and maintenance manuals.
   5. Division 01 Section - Project Record Documents for submitting record Drawings, record Specifications, and record Product Data.
   6. Division 01 Section - Closeout Procedures for submitting warranties Project Record Documents and operation and maintenance manuals.
   7. Division 01 Section - Demonstration and Training for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.03 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.04 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
   2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
      a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
   4. Format: Arrange the following information in a tabular format:
      a. Scheduled date for first submittal.
      b. Specification Section number and title.
      c. Submittal category: Action; informational.
      d. Name of subcontractor.
      e. Description of the Work covered.
      f. Scheduled date for Architect's final release or approval.
      g. Scheduled date of fabrication.
      h. Scheduled dates for purchasing.
      i. Scheduled dates for installation.
      j. Activity or event number.

1.05 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals.
   1. Architect may furnish Contractor specifically requested digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.
      a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
      b. Digital Drawing Software Program: The Contract Drawings are available in AutoCad or Revit.
      c. Contractor shall execute a data licensing agreement in the form of an Agreement acceptable to Architect, as a prerequisite for Architect providing electronic files. Architect's consultants may require additional agreements as condition for release of their electronic files.
         1) Contractor shall bind all parties receiving or using these files to the same agreements.
      d. The following digital data files may be furnished for each appropriate discipline:
         1) Site plan.
         2) Architectural floor plans.
         3) Drawings specifically requested by Contractor and agreed to be provided by the Architect and Architect's consultants.
B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Concurrent Review of Submittals: Where two or more submittals require concurrent review, Architect retains the right to hold submittals until all submittals required for concurrent review are received. Architect will notify Contractor of necessity for concurrent submittals after a submittal is received in absence of other related submittals required for concurrent review. The date of receipt of the last submittal required for concurrent review will be considered the date for the start of Architect's review time.
    a. Examples of submittals for concurrent review include but are not limited to: Roofing and related flashing, accessories, and waterproofing installed by roofer; doors, door frames, and hardware submittals; and window or glazing systems and glass.
6. Submittals received after 2pm will be logged as the next day.

D. Transmittals for Paper and Electronic Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review or discard any submittals received from sources other than the Contractor. Package each submittal individually. Do not group different specification sections together in one submittal. Provide transmittal form transmittal form including the following information:
1. Submittal number unique identifier, including revision identifier, and with identification of submittal contents as follows:
    a. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A), or next sequential letter.
    b. Name of Specification Section, with brief description of submittal contents for sections requiring multiple submittals.
2. Overall sequence number each submittal starting with number 1 for the first submittal transmitted to the Architect, 2 for the second and so forth, indicating the chronological submission of each submittal.
3. Provide means for insertion to permanently record Contractor's review and approval markings. Indicate Contractor's completed review prior to submitting to Architect.
4. Include the following information for processing and recording:
    a. Project name.
    b. Date of submission to Architect.
    c. Name of Architect.
    d. Name of Contractor.

e. Additionally, indicate names of the following, as applicable, including indication of the entity that prepared each submittal:
   1) Name of subcontractor.
   2) Name of supplier / vendor.
   3) Name of manufacturer.
f. Drawing number and detail references, as appropriate.
g. Location(s) where product is to be installed, as appropriate.
h. Remarks and other necessary identification.
i. Signature of transmitter.

E. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
   1. Number of Copies: Provide paper submittals with a minimum of 2 copies for submittals for Architect's review, with an additional copy for each of Architect's consultants that will also review each submittal. Architect, and each of Architect's consultants involved in review, will retain one copy each for their records, and return additional copies with annotations.
      a. Submit additional copies if Contractor requires more than one paper copy returned for Contractor's use. When shop drawings are required to be annotated by Contractor for as-built conditions and submitted as record drawings, include a copy dedicated for this purpose.
      b. Submit additional copies as required by each other concurrent reviewer, as applicable, in addition to specified number of copies to Architect.
   2. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

F. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
   1. Assemble complete submittal package into a single indexed .pdf format file, or .pdf files within a .zip file where multiple files cannot be avoided, incorporating submittal requirements of a single Specification Section and transmittal form. Name file according to Submittal number and contents identification.
   2. Architect, and Architect's consultants as applicable, will return electronic submittal with annotations containing their comments as applicable.
   3. Architect retains right to require a paper submittal for shop drawings or other complex submittals that may require substantial notation to be marked on submittal sheets or drawings, at Architect's discretion.

G. Options: Circle or highlight options to be provided on product data and specification sheets. Identify options requiring selection by Architect with red colored boxes or text.

H. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision.
   3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
   4. The architect will review the first and a second revised submittal at no cost to the contractor. Additional submittals needed to obtain approval will required time reimbursement from the contractor at the Project Architect’s standard rate for additional hours spent due to third and subsequent resubmittals of the same product or system.

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
K. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.01 SUBMITTAL PROCEDURES

A. Organization: All required submittals for a specification section must be transmitted together complete as one submittal transmittal. Partial transmittals will not be accepted for review.
B. Contractor's responsibilities:
    1. Contractor shall thoroughly check shop drawings, project data and samples for compliance with Contract Documents and list variances prior to submission.
    2. Contractor represents by approving and submitting Shop Drawings, Product Data and samples that he has or will coordinate and verify dimensions, all materials, field measurements, field construction criteria, catalog numbers and similar data with requirements of work and of Contract Documents prior to submitting.
    3. Submittals shall bear Contractor's stamp and initials certifying that they have been checked. Submittals without stamp & initials shall be returned un-reviewed.
    4. Contractor's responsibility for deviations or errors and omissions in submittals is not relieved by Architect/ Engineer review of submittals, unless Architect/ Engineer gives specific written acceptance of specific deviations.
    5. Do not proceed with purchasing, fabrication or delivery of work which requires submittals until return of submittals with Architect/Engineer stamp and initials or signature evidencing final review and approval of submittals.
    6. Contractor is responsible for dimensions at job site, quantities, coordinating component parts and trades to effect unified construction and implement construction techniques, safety of incremental units, and satisfactory performance of work in accordance with Contract Documents.
    7. Delays caused by failure of Contractor to check shop drawings and to stamp with this approval shall be Contractor's responsibility.
    8. Coordinate preparation and processing of submittals with performance of work to avoid delays.
    9. No extension of time shall be allowed because of failure to properly coordinate and sequence submittals.
C. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
    1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.
        a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
    2. Action Submittals: Submit paper copies of each submittal unless otherwise indicated. Architect and his consultants involved in review of each submittal will retain one copy each; and will annotate and return additional copies to Contractor.
    3. Informational Submittals: Submit electronic copies of each submittal unless otherwise indicated. Architect will not return copies.
    4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

D. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.

E. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 x 11 inches, but no larger than 30 x 42 inches .
3. Submit Shop Drawings in the following format:
a. PDF electronic file.
1) Architect retains the right, at Architect's sole discretion, to require paper copies for submittals that may require extensive annotation on submittal sheets, and for oversize sheets or other conditions that may be difficult to review in electronic format. In each case, Architect and Architect's consultants involved in review will retain one copy each and return the remainder of copies with annotations.

F. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
a. Generic description of Sample.
b. Product name and name of manufacturer.

c. Sample source.
d. Number and title of applicable Specification Section.
e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Unless otherwise indicated, submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
   b. Selector sheets printed by Contractor, and website information, are not acceptable samples for selection. Submit Manufacturer's selector sheets and samples with accurate color and texture representation as applicable.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Unless otherwise indicated, submit three sets of Samples. Architect will retain one Sample sets; remainder will be returned.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

G. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
   2. Manufacturer and product name, and model number if applicable.
   3. Number and name of room or space.
   4. Location within room or space.
   5. Submit product schedule in the following format:
      a. PDF electronic file.

2.02 INFORMATION SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements in Division 1 Section - Quality Requirements.

B. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section - Project Management and Coordination.
C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section - Construction Progress Documentation.
D. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section - Payment Procedures.
E. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section - Quality Requirements.
F. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section - Closeout Procedures.
G. Maintenance Data: Comply with requirements specified in Division 01 Section - Operation and Maintenance Data.
H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
I. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
J. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
K. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
L. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
M. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
N. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
O. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
P. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
    1. Name of evaluation organization.
    2. Date of evaluation.
    3. Time period when report is in effect.
    4. Product and manufacturers' names.
    5. Description of product.
    6. Test procedures and results.

7. Limitations of use.

Q. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

R. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

S. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

T. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.03 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.01 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section - Closeout Procedures.

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 ARCHITECT'S ACTION

A. Action Submittals:

1. Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
    a. No exceptions taken.
    b. Make corrections as noted.
    c. Revise and resubmit.
    d. Rejected.
    e. Other.
2. Submittals or items stamped "No exceptions taken" indicates that Architect does not require resubmittal, and may include comments such as Architect's selection of options.
3. Submittals or items stamped "Make corrections as noted" indicates that Architect does not require resubmittal if the annotated corrections are made. However, items or submittals with this action noted may require resubmittal if:
    a. Contractor believes indicated corrections are not correct responses, and requires subsequent review. Resubmittal should indicate Contractor's reasons for concern and additional supporting information as applicable.
    b. Contractor believes a resubmittal is required to address or confirm additional questions through subsequent review, related to items not considered by the original submittal or that were brought to light by Architect's previous review comments.
4. Revise and resubmit items or submittals stamped "revise and resubmit" and "rejected", to address all comments requiring resubmittal and the reasons for rejection.
5. When "Other" action is indicated, Architect will provide additional comment describing the subsequent action required.
6. Submittals may be stamped with more than one action regarding portions of the submittal, and may note that only portions of the original submittal are required to be resubmitted.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00

SECTION 01-4000 – QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.
B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
   3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
C. Related Sections include the following:
   1. Division 1 Section - Allowances for testing and inspecting allowances.
   2. Division 1 Section - Construction Progress Documentation for developing a schedule of required tests and inspections.
   3. Division 1 Section - Cutting and Patching for repair and restoration of construction disturbed by testing and inspecting activities.
   4. Divisions 2 - 48 Sections for additional specific test and inspection requirements.

1.03 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.
C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.
D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

E. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.04 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.05 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.06 REGULATORY REQUIREMENTS

A. Copies of Regulations: Obtain copies of the following regulations and retain at Project site to be available for reference by parties who have a reasonable need:

1. ADA Accessibility Standards.

1.07 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
   1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
   2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Description of test and inspection.
   3. Identification of applicable standards.
   4. Identification of test and inspection methods.
   5. Number of tests and inspections required.
   6. Time schedule or time span for tests and inspections.
   7. Entity responsible for performing tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

E. Reports: Prepare and submit certified written reports that include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Ambient conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

F. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.08 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those

performed for installations of the system, assembly, or product that is similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated in accordance with ASTM E329, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.
   1. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
   5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   6. Demolish and remove mockups when directed, unless otherwise indicated.

1.09 QUALITY CONTROL

A. Owner Responsibilities: **The Owner will hire and pay for tests and inspections, unless explicitly assigned to Contractor.** Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Refer to Division 23 for Testing, Adjusting and Balancing specifications.
   2. Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   3. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged by Owner and a description of the types of testing and inspecting they are engaged to perform.
   4. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
   1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies, Engineer & Architect at least 72 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Special Tests and Inspections: Engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
   1. Testing agency will notify Architect**,** and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   2. Testing agency will submit a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
   3. Testing agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   4. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   5. Testing agency will retest and re-inspect corrected work.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

E. Retesting/Reinspections: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspections, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   3. Submit a certified written report of each test, inspection, and similar quality-control service to recipients on the distribution list as established by Architect, or in the absence of that, through Contractor.
   4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
   5. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field-curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.
   1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 EARTHWORK AND TESTING

A. Inspect and approve subgrade prior to placing material.
B. Perform relative compaction testing determined as outlined in ASTM D-1557.
C. Perform moisture density test for each soil type determined as outlined in ASTM D-698.
D. Field density tests shall be made at all fill areas at backfill and at existing subgrade; no less than two tests per lift.
E. Filling and Backfilling:
   1. The Contractor shall make available to the laboratory, adequate samples of each fill and backfill material from the proposed sources of supply not less than 10 days prior to the start of the work.
   2. The Laboratory shall analyze the samples as required to provide a soil description and to determine compliance with the quality requirements.
      a. Test for liquid limit in accordance with ASTM D423.
      b. Test for plastic limit of soils and plasticity index of soils in accordance with ASTM D424.
      c. Test for moisture density relations of soil in accordance with ASTM D698.
   3. Furnish a report for each individual test and state whether sample conforms to the specified requirements or reasons for nonconformance.
   4. Inspect and approve subgrade prior to placement of fill material.
   5. Make in-place compaction tests for moisture content, moisture-density relationship, and density of fill materials.
   6. Perform not less than two compaction tests for each 3,000 SF of surface for each layer of fill under the building and not less than two compaction tests for each 5,000 SF of surface for each layer of fill or undisturbed earth on areas of site to be covered by paving walks or traffic approaches.

3.02 DRILLED PIER INSPECTION

A. The Contractor shall pay for services by a qualified soils laboratory to provide inspection of pier drilling operations as follows:
   1. Qualified soils personnel on site for pier drilling operation inspection.
   2. The laboratory representative shall remain on the site until the Contractor can properly identify the bearing formations with accuracy and without assistance from the laboratory.
   3. Should any unusual conditions be encountered during drilling operations, the laboratory shall be contacted immediately so that additional inspection can be provided.
   4. The lab report shall:
      a. Identify each pier drilled;
      b. The date and time of drilling and concrete placement;
      c. Verify pier and bell diameters;
      d. Depth of pier from surface;

e. Depth of bearing stratum from surface;
f. Required and actual penetration;
g. Depth from top of concrete;
h. Condition at bottom;
i. Diameter and length of casing;
j. Reinforcing used.

B. The Contractor shall allow for a minimum of 2 days notice to be given the laboratory for the inspection work.

3.03 CONCRETE REINFORCEMENT TESTING AND INSPECTION

A. Reinforcing Bar Inspection: Inspect reinforcing bar placement including size, number, configuration, locations, clearances, and related criteria.

B. Reinforcing: Inspect all reinforcing steel prior to placement of concrete for compliance with the Contract Documents and the approved shop drawings. All instances of noncompliance shall be immediately brought to the attention of the Contractor. If uncorrected by the contractor, they shall be listed in the report.

1. Observe and report the following: number and size of bars; bending; splicing; clearance to forms; clearance between bars; rust, from oil or other contamination; fabrication and installation of embedded metal assemblies, including visual inspection of all welds.

C. Inspector shall have a minimum of three years experience inspecting reinforcing steel in projects of similar size.

3.04 CAST-IN-PLACE CONCRETE TESTING AND INSPECTION

A. Materials and operations shall be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the Architect for final acceptance.

B. Testing agencies shall meet the requirements of "Recommended Practice for Inspection and Testing Agencies for Concrete and Steel in Construction", ASTM E-329-70.

C. The following review and testing services shall be performed by the designated laboratory:

1. The testing laboratory shall review the submitted mix designs for conformance with "Building Code Requirements for Structural Concrete" ACI 318-95.
2. Secure composite samples in accordance with "Method of Sampling Fresh Concrete" ASTM C172, Current Edition.
3. Mold and cure five specimens from each sample in accordance with "Method of Making and Curing Concrete Compression and Flexural Specimens in the Field", ASTM C31, Current Edition.
4. Test specimens in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders", ASTM C39, Current Edition. Two specimens shall be tested at 28 days for acceptance and two shall be tested at 7 days for information. The remaining cylinder shall be tested as directed.
5. Make one strength test for each 100 cubic yards or fraction thereof, of each mix design or concrete placed in any one day.
6. Determine slump for each strength test and whenever consistency of concrete appears to vary, using "Method of Test for Slump of Portland Cement Concrete" ASTM C143, Current Edition and air content of normal weight or light weight concrete sample for each strength test.
7. Determine temperature of concrete sample for each strength test.
8. Other testing services needed or required shall be paid by the Contractor.
9. Inspect and control the concrete mixing and loading of transit-mix trucks at the plant at the start of each day's mixing. Check mixing from mixers before mix begins to set and within time limits set forth in ASTM C94. Prevailing conditions shall be compared to the

criteria indicated on the appropriate design mix (temperature, moisture, condition of aggregates, etc.).

D. Any significant deviance shall be immediately reported to the Architect and the design
   1. laboratory and corresponding adjustments to the mix made before any materials are discharged.
   2. Control the addition of water to the concrete at the job site and the length of time the concrete is allowed to remain in the truck during the pour.
   3. Specimens for pumped concrete shall be taken at the discharge and of pumping equipment.
   4. Certify each delivery ticket indicating class of concrete delivered (or poured), amount of water added and the time at which the cement and aggregate was discharged into the truck, and the time at which the concrete was discharged from the truck.

E. Provide and maintain for the use of the testing agency adequate facilities for proper curing of concrete test specimens on the project site in accordance with "Methods of Making and Curing Concrete Compression and Flexural Specimens in the Field" ASTM C31, Current Edition.Evaluation and Acceptance:
   1. The strength level of the concrete will be considered satisfactory if 90% of the strength test results and the averages of all sets of three consecutive strength test results equal or exceed specified strength and no individual test result is below specified strength by more than 500 psi.
   2. Completed concrete work will be accepted when the requirements of "Specifications for Structural Concrete for Buildings" ACI 301-84, Chapter 18 have been complied with.
   3. In any case, where the average strength of the laboratory control cylinders, as shown by the tests for any portion of the structure, falls below the minimum ultimate compressive strength hereinbefore specified, the Architect shall have the right to require the Contractor to provide improved curing conditions of temperature and moisture to secure the required strength. Also, if the average strength of the laboratory control cylinders should fall so low as to cause the portions of the structure to which the respective unsatisfactory test reports apply to be in question by the Architect, the Contractor shall follow the core procedure set forth in the current edition of ASTM Designation C42. If the results of the core tests indicate, in the opinion of the Architect, that the strength of the structure is inadequate, such replacement, load testing, or strengthening as may be ordered by the Architect shall be provided by the Contractor without cost to the Owner.
   4. The testing laboratory shall control field adjustments made to concrete mixes to compensate for field conditions and report same.
   5. Wherever the testing laboratory recognizes a trend of decreasing quality in the concrete due to changing reasons, conditions of curing or other cause; this shall be brought to the attention of the Architect, along with a recommendation for corrective action to be taken before the materials fall below the requirements of these Specifications.

F. Reports: In addition, the testing laboratory shall make one copy of the reports to the concrete supplier.

3.05 LIGHTWEIGHT STRUCTURAL CONCRETE

A. Unit weight of lightweight structural concrete:
   1. Make two test specimens for each 50 cubic yards of lightweight concrete placed.
   2. For each test specimen, determine freshly mixed unit weight and air dry unit weight of lightweight concrete.
   3. Test in accordance with ASTM C567.

3.06 MASONRY MORTAR AND GROUTS

A. Check mix designs for mortar and grouts. Make tests of mortar and grout to approval for use at project site. Perform four (4) tests in accordance with ASTM C39 for each twenty-five (25) cubic yards of mortar.
B. Submit an additional copy of the laboratory reports to the steel supplier.
C. Compressive Test for Grout:
    1. Secure composite samples of grout at the job site in accordance with ASTM C172.
    2. Mold and cure three, 3" diameter by 6" tall cylinders form each sample in accordance with ASTM C31. Supervise the curing protection provided by the contractor for the test specimens in the field and transportation to the laboratory. The test cylinders shall be stored in the field 24 hours and then moved to the laboratory and cured in accordance with ASTM C31.
    3. Test specimens in accordance with ASTM C39. Two test specimens shall be tested at 28 days for acceptance and one shall be tested at seven days for information.
    4. Make one strength test (three cylinders) for each five cubic yards of grout placed, but not less than one strength test for each 5000 square feet of wall area.

3.07 INSPECTING STRUCTURAL STEEL

A. Field Inspection
    1. Proper erection of all pieces.
    2. Proper installation of all bolts, including checking the calibration of impact wrenches used with high strength bolts.
    3. Plumbness of structure and proper bracing.
    4. Ultrasonic inspection of all full penetration welds.
    5. Record and measure camber of beams upon arrival and before erection with compliance with the specified camber. Measure beam lying flat with web in the horizontal position. Members outside the specified camber tolerance shall be returned to the shop.
B. Qualification of Welders: Before assigning any welder to work covered by this section of the Specifications, the fabricator shall provide the Testing Laboratory with certification that each of the the welders to be employed on the project has passed qualification tests within the last year using procedures covered in the American Welding Society Standard D1.0-63.
C. The contractor shall be responsible for furnishing fabrication and erection inspection and testing of all welds in accordance with AWS D1.1, Chapter 6. Submit records of inspections and tests to the Owner's testing laboratory for their review.
D. Inspection of shop and field welding shall be "verification inspection" in accordance with Section 6 of AWS D1.1 and as follows:
    1. Visually inspect the welding of all shop fabricated members and note the location of all cover plates, connectors, bearing stiffeners, splices, and fillet welds for proper return around ends and check for seams, folds, and delamination.
    2. Ultrasonically test all full penetration welds in accordance with ASTM E164.
    3. Root passes shall be thoroughly be inspected for cracks. All cracks shall be gouged out and rewelded to two inches beyond each end of the crack.
    4. Mark all welds requiring repairs and make reinspections.
    5. The Testing Laboratory inspector shall advise the Owner and Architect of any shop and/or field conditions which, in his opinion, may require further tests and examination. Such further tests shall be performed as authorized by the Owner and Architect.
    6. The Owner reserves the right to use ultrasonic or radiographic inspection to verify the adequacy of all welds. Testing procedures and acceptance criteria shall be as specified in AWS D1.1.
E. Inspection of bolted construction shall be in accordance with AISC "Specification for Structural Steel Buildings" and as follows:
    1. All bolts shall be visually inspected to ensure that the plies have been brought into "snug" contact.

2. High strength bolts shall be inspected in accordance with Section 9 of the AISC “Specifications for Structural Joints Using ASTM A325 or A490 Bolts.” Bolts are to be fully torqued as required by the AISC specification.
3. For all high strength bolts, the inspector shall observe the required jobsite testing and calibration, and shall confirm that the procedure to be used provides the required tension.

3.08 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
   2. Comply with the Contract Document requirements for Division 1 Section - Cutting and Patching.
B. Protect construction exposed by or for quality-control service activities.
C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01-4100 – AIR BARRIER SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. This section includes administrative and procedural requirements for accomplishing an airtight building enclosure that controls infiltration and exfiltration of air.
   1. The airtight components of the building enclosure and the joints, junctures and transitions between materials, products, and assemblies forming the air-tightness of the building enclosure are called "the air barrier system". Services include coordination between the trades, the proper scheduling and sequencing of the work, preconstruction meetings, inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.
   2. The Contractor shall ensure that the intent of constructing the building enclosure with a continuous air barrier system to control air leakage into, or out of, the conditioned and tempered spaces is achieved. The air barrier system shall have the following characteristics:
      a. It must be continuous, with all joints sealed.
      b. It must be structurally supported to withstand positive and negative air pressures applied to the building enclosure.
      c. Continuity shall be made between:
         1) Foundation and walls.
         2) Walls and windows or doors.
         3) Different wall systems.
         4) Wall and roof / wall and underside of deck.
         5) Wall and roof or ceiling / floor assemblies between conditioned and unconditioned spaces, and between conditioned and tempered spaces.
         6) Wall, floor and roof across construction joints, control joints, and expansion joints.
         7) Walls, floors and roof to structural, utility, pipe, duct, and other mechanical / electrical penetrations through construction assemblies.
         8) Other joints and penetrations affecting air tightness of the construction assembly.
   3. Elimination of Air Barrier Penetrations: All penetrations of the air barrier and paths of air infiltration / exfiltration shall be sealed.

B. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

C. Requirements of this section relate to the coordination between subcontractors required to provide an airtight building enclosure, customized fabrication and installation procedures, not production of standard products.
   1. Contractor shall provide continuity of all air barrier, weatherization materials and building envelope enclosure assemblies including all joints and transition materials as required to provide a whole building air barrier system meeting the requirements of this specification.

2. Specific quality-control requirements for individual construction activities and products are specified in the sections of the specifications. Requirements in those sections may also cover production of standard products, and requirements for joints between certain air barrier systems and construction assemblies. It is the Contractor's responsibility to ensure that each subcontractor is adequately and satisfactorily performing the quality assurance documentation, tests and procedures required by each section, and by this specification.
3. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
4. Requirements for Contractor to provide an airtight building enclosure is not limited by quality-control services required by Architect, Owner, or authorities having jurisdiction and are not limited by the provisions of this specification.

D. Related Sections include the following:
1. Division 1 Section Quality Control
2. Division 1 Section Schedule
3. Division 1 Section Meetings
4. Division 3 Section Concrete
5. Division 3 Section Precast Concrete
6. Division 6 Section Wood Sheathing
7. Division 7 Roofing Section(s)
8. Division 7 "Air Barrier", "Weather Barrier", "Vapor Barrier", "Dampproofing", and similar Sections forming part of the overall building weatherization system.
9. Division 7 Section Joint Sealants
10. Division 8 Section Windows
11. Division 8 Section Exterior Doors
12. Division 8 Section Storefronts and Entrances.
13. Other Division 7 and 8 Sections related to the building envelope.

1.03 RESPONSIBILITIES

A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide coordination of the trades, and the sequence of construction to ensure continuity of the air barrier system joints, junctures and transitions between materials and assemblies of materials and products, from substructure to walls to roof. Provide quality assurance procedures, testing and verification as specified herein. Facilitate inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction or by the Owner. Costs for these services are included in the Contract Sum.
1. Organize preconstruction meetings between the trades involved in the whole building's air barrier system to discuss where each trade begins and ends and the responsibility and sequence of installation of all the air-tight joints, junctures, and transitions between materials, products and assemblies of products specified in the different sections, to be installed by the different trades.
2. Build mock-ups before proceeding with the work, satisfactory to the Architect, of each air-tight joint type, juncture, and transition between products, materials and assemblies.
    a. Architect's review of mockups is for general compliance with intent of the specified requirements and does not relieve Contractor of responsibility to achieve the total building Performance Requirements as specified herein.

B. Duties of the Testing and Inspection Agency: The independent agency engaged to perform inspections, sampling, and testing of air barrier materials, components and assemblies specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
1. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
3. The agency shall not perform any duties of the Contractor.

1.04 PERFORMANCE REQUIREMENTS

A. Materials: materials used for the air barrier system in the opaque envelope shall have an air permeance not to exceed 0.004 cfm/ft2 under a pressure differential of 0.3 in. water (1.57psf) (0.02 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2178.

B. Assemblies of materials and components: shall have an air permeance not to exceed 0.04 cfm/ft2 under a pressure differential of 0.3 in. water (1.57psf) (0.2 L/s.m2 @ 75 Pa) when tested in accordance with ASTM E 2357.

C. The entire building: The air leakage of the entire building shall not exceed 0.4 cfm/ft2 under a pressure differential of 0.3 in. water (1.57psf) (2.0 L/s.m2 @ 75 Pa) when tested according to ASTM E 779.

1.05 DEFINITIONS

A. ABAA: Air Barrier Association of America

B. Conditioned Spaces: Spaces provided with both heating and cooling.
1. Tempered Spaces: Spaces provided with heating only, or limited heating such as may be required to prevent freezing.

C. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

D. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

E. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

F. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.06 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Inspections Report: Submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.
1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
a. Date of issue.

b. Project title and number.
c. Name, address, and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the Work and test method.
g. Identification of product and Specification Section.
h. Complete inspection or test data.
i. Test results and an interpretation of test results.
j. Ambient conditions at the time of sample taking and testing.
k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

1.07 QUALITY ASSURANCE

A. Qualifications for Air Barrier Testing and Inspection Agencies: Engage Air Barrier inspection and testing service agencies, with Certified Air Barrier Specialist personnel, including independent testing laboratories, that are prequalified and that specialize in the types of air barrier system inspections and tests to be performed.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 REPAIR AND PROTECTION

A. Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

3.02 TESTING AND INSPECTION

A. The Owner will hire a testing and inspection agency to provide Occasional observation and inspection during installation of the air barrier system. The testing and inspection agency will provide the following listed services:
   1. Qualitative Testing and Inspection:
      a. Daily reports of observations, with copies to the Owner, Contractor and Architect.
      b. Continuity of the air barrier system throughout the building enclosure with no holes, gaps, or discontinuities.
      c. Structural support of the air barrier system to withstand design air pressures.
      d. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions and mortar droppings.
      e. Site conditions for application temperature and dryness of substrates.
      f. Maximum length of exposure time of materials to ultra-violet deterioration.
      g. Surfaces are properly primed.
      h. Laps in material are 2"minimum, shingled in the correct direction (or mastic applied on exposed edges), with no fish-mouths.
      i. Mastic / sealants applied at applicable cut edges.
      j. Roller has been used to enhance adhesion.
      k. Measure application thickness of liquid-applied materials to manufacturer’s specifications for the specific substrate.

l. Materials selected and installed for compatibility.
m. Transitions at changes in direction, and structural support at gaps.
n. Connections between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.
o. All penetrations sealed.
p. ASTM E 1186 "Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems."
    1) Infrared scanning with pressurization/depressurization.
    2) Smoke pencil with pressurization/depressurization.
    3) Pressurization/depressurization with use of anemometer
    4) Generated sound with sound detection
    5) Tracer gas measurement of decay rate
    6) Chamber pressurization/depressurization in conjunction with smoke tracers
    7) Chamber depressurization using detection liquids

2. Quantitative tests:
    a. Provide written test reports of all tests performed, with copies to the Owner, Contractor and Architect.
    b. Material compliance for maximum air permeance, ASTM E 2178.
    c. ASTM E 283, Determining rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.
    d. Assemblies, ASTM E 2357, test pressure and allowable air leakage rate to be determined by design professional for interior design conditions and location of project.
    e. Whole building, floors, or suites, ASTM E779, Determining Airtightness of Buildings Air Leakage Rate by Single Zone Air Pressurization.
    f. Windows and connections to adjacent opaque assemblies, ASTM E783 method B
    g. Tracer gas testing, ASTM E741
    h. Pressure test, ASTM E330
    i. Bond to substrate, ASTM D4541

END OF SECTION 01 41 00

SECTION 01-4200 – REFERENCE STANDARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.
B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
H. "Provide": Furnish and install, complete and ready for the intended use.
I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built. Refer to Division 01 "Work Restrictions".

1.03 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
    1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within

reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.04 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
   1. Where abbreviations and acronyms used in Specifications or other Contract Documents are not listed, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

AABC	Associated Air Balance Council www.aabc.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists www.aatcc.org	(919) 549-8141
ABMA	American Bearing Manufacturers Association www.americanbearings.org	(202) 367-1155
ACI	American Concrete Institute (Formerly: ACI International) www.concrete.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The)	(205) 257-2530

	www.aeic.org	
AF&PA	American Forest & Paper Association	(800) 878-8878
	www.afandpa.org	(202) 463-2700
AGA	American Gas Association	(202) 824-7000
	www.aga.org	
AHAM	Association of Home Appliance Manufacturers	(202) 872-5955
	www.aham.org	
AHRI	Air-Conditioning, Heating, and Refrigeration Institute (The)	(703) 524-8800
	www.ahrinet.org	
AI	Asphalt Institute	(859) 288-4960
	www.asphaltinstitute.org	
AIA	American Institute of Architects (The)	(800) 242-3837
	www.aia.org	(202) 626-7300
AISC	American Institute of Steel Construction	(800) 644-2400
	www.aisc.org	(312) 670-2400
AISI	American Iron and Steel Institute	(202) 452-7100
	www.steel.org	
AITC	American Institute of Timber Construction	(303) 792-9559
	www.aitc-glulam.org	
AMCA	Air Movement and Control Association International, Inc.	(847) 394-0150
	www.amca.org	
ANSI	American National Standards Institute	(202) 293-8020
	www.ansi.org	
AOSA	Association of Official Seed Analysts, Inc.	(607) 256-3313
	www.aosaseed.com	
APA	APA - The Engineered Wood Association	(253) 565-6600
	www.apawood.org	
APA	Architectural Precast Association	(239) 454-6989
	www.archprecast.org	

API	American Petroleum Institute	(202) 682-8000
	www.api.org	
ARI	Air-Conditioning & Refrigeration Institute	
	(See AHRI)	
ARI	American Refrigeration Institute	
	(See AHRI)	
ARMA	Asphalt Roofing Manufacturers Association	(202) 207-0917
	www.asphaltroofing.org	
ASCE	American Society of Civil Engineers	(800) 548-2723
	www.asce.org	(703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute	
	(See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers	(800) 527-4723
	www.ashrae.org	(404) 636-8400
ASME	ASME International	(800) 843-2763
	(American Society of Mechanical Engineers)	(973) 882-1170
	www.asme.org	
ASSE	American Society of Safety Engineers (The)	(847) 699-2929
	www.asse.org	
ASSE	American Society of Sanitary Engineering	(440) 835-3040
	www.asse-plumbing.org	
ASTM	ASTM International	(610) 832-9500
	(American Society for Testing and Materials International)	
	www.astm.org	
ATIS	Alliance for Telecommunications Industry Solutions	(202) 628-6380
	www.atis.org	

AWEA	American Wind Energy Association	(202) 383-2500
	www.awea.org	
AWI	Architectural Woodwork Institute	(571) 323-3636
	www.awinet.org	
AWMAC	Architectural Woodwork Manufacturers Association of Canada	(403) 453-7387
	www.awmac.com	
AWPA	American Wood Protection Association	(205) 733-4077
	(Formerly: American Wood-Preservers' Association)	
	www.awpa.com	
AWS	American Welding Society	(800) 443-9353
	www.aws.org	(305) 443-9353
AWWA	American Water Works Association	(800) 926-7337
	www.awwa.org	(303) 794-7711
BHMA	Builders Hardware Manufacturers Association	(212) 297-2122
	www.buildershardware.com	
BIA	Brick Industry Association (The)	(703) 620-0010
	www.gobrick.com	
BICSI	BICSI, Inc.	(800) 242-7405
	www.bicsi.org	(813) 979-1991
BIFMA	BIFMA International	(616) 285-3963
	(Business and Institutional Furniture Manufacturer's Association)	
	www.bifma.com	
BISSC	Baking Industry Sanitation Standards Committee	(866) 342-4772
	www.bissc.org	
BWF	Badminton World Federation	60 3 9283 7155
	(Formerly: International Badminton Federation)	

	www.bwfbadminton.org	
CDA	Copper Development Association	(800) 232-3282
	www.copper.org	(212) 251-7200
CEA	Consumer Electronics Association	(866) 858-1555
	www.ce.org	(703) 907-7600
CFFA	Chemical Fabrics & Film Association, Inc.	(216) 241-7333
	www.chemicalfabricsandfilm.com	
CFSEI	Cold-Formed Steel Engineers Institute	(866) 465-4732
	www.cfsei.org	(202) 263-4488
CGA	Compressed Gas Association	(703) 788-2700
	www.cganet.com	
CIMA	Cellulose Insulation Manufacturers Association	(888) 881-2462
	www.cellulose.org	(937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association	(630) 584-1919
	www.cisca.org	
CISPI	Cast Iron Soil Pipe Institute	(404) 622-0073
	www.cispi.org	
CLFMI	Chain Link Fence Manufacturers Institute	(301) 596-2583
	www.chainlinkinfo.org	
CPA	Composite Panel Association	(703) 724-1128
	www.pbmdf.com	
CRI	Carpet and Rug Institute (The)	(706) 278-3176
	www.carpet-rug.org	
CRRC	Cool Roof Rating Council	(866) 465-2523
	www.coolroofs.org	(510) 485-7175
CRSI	Concrete Reinforcing Steel Institute	(800) 328-6306
	www.crsi.org	(847) 517-1200
CSA	CSA International	(866) 797-4272
	(Formerly: IAS - International Approval Services)	(416) 747-4000

	www.csa-international.org	
CSI	Construction Specifications Institute (The)	(800) 689-2900
	www.csinet.org	(703) 684-0300
CSSB	Cedar Shake & Shingle Bureau	(604) 820-7700
	www.cedarbureau.org	
CTI	Cooling Technology Institute	(281) 583-4087
	(Formerly: Cooling Tower Institute)	
	www.cti.org	
CWC	Composite Wood Council	
	(See CPA)	
DASMA	Door and Access Systems Manufacturers Association	(216) 241-7333
	www.dasma.com	
DHI	Door and Hardware Institute	(703) 222-2010
	www.dhi.org	
ECA	Electronic Components Association	(703) 907-8024
	www.ec-central.org	
ECAMA	Electronic Components Assemblies & Materials Association	
	(See ECA)	
EIA	Electronic Industries Alliance	
	(See TIA)	
EIMA	EIFS Industry Members Association	(800) 294-3462
	www.eima.com	(703) 538-1616
EJMA	Expansion Joint Manufacturers Association, Inc.	(914) 332-0040
	www.ejma.org	
ESD	ESD Association	(315) 339-6937
	(Electrostatic Discharge Association)	
	www.esda.org	
ESTA	Entertainment Services and Technology Association	

	(See PLASA)	
EVO	Efficiency Valuation Organization	(415) 367-3643
	www.evo-world.org	44 20 88 167 857
FM Approvals	FM Approvals LLC	(781) 762-4300
	www.fmglobal.com	
FM Global	FM Global	(401) 275-3000
	(Formerly: FMG - FM Global)	
	www.fmglobal.com	
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.	(407) 671-3772
	www.floridaroof.com	
FSA	Fluid Sealing Association	(610) 971-4850
	www.fluidsealing.com	
FSC	Forest Stewardship Council U.S.	(612) 353-4511
	www.fscus.org	
GA	Gypsum Association	(301) 277-8686
	www.gypsum.org	
GANA	Glass Association of North America	(785) 271-0208
	www.glasswebsite.com	
GS	Green Seal	(202) 872-6400
	www.greenseal.org	
HI	Hydraulic Institute	(973) 267-9700
	www.pumps.org	
HI/GAMA	Hydronics Institute/Gas Appliance Manufacturers Association	
	(See AHRI)	
HMMA	Hollow Metal Manufacturers Association	
	(See NAAMM)	
HPVA	Hardwood Plywood & Veneer Association	(703) 435-2900

	www.hpva.org	
HPW	H. P. White Laboratory, Inc.	(410) 838-6550
	www.hpwhite.com	
IAPSC	International Association of Professional Security Consultants	(415) 536-0288
	www.iapsc.org	
IAS	International Approval Services	
	(See CSA)	
ICBO	International Conference of Building Officials	
	(See ICC)	
ICC	International Code Council	(888) 422-7233
	www.iccsafe.org	(202) 370-1800
ICEA	Insulated Cable Engineers Association, Inc.	(770) 830-0369
	www.icea.net	
ICPA	International Cast Polymer Alliance	(703) 525-0511
	www.icpa-hq.org	
ICRI	International Concrete Repair Institute, Inc.	(847) 827-0830
	www.icri.org	
IEC	International Electrotechnical Commission	41 22 919 02 11
	www.iec.ch	
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)	(212) 419-7900
	www.ieee.org	
IES	Illuminating Engineering Society	(212) 248-5000
	(Formerly: Illuminating Engineering Society of North America)	
	www.ies.org	
IESNA	Illuminating Engineering Society of North America	
	(See IES)	
IEST	Institute of Environmental Sciences and Technology	(847) 981-0100
	www.iest.org	
IGMA	Insulating Glass Manufacturers Alliance	(613) 233-1510

	www.igmaonline.org	
IGSHPA	International Ground Source Heat Pump Association	(405) 744-5175
	www.igshpa.okstate.edu	
Intertek	Intertek Group	(800) 967-5352
	(Formerly: ETL SEMCO; Intertek Testing Service NA)	
	www.intertek.com	
ISA	International Society of Automation (The)	(919) 549-8411
	(Formerly: Instrumentation, Systems, and Automation Society)	
	www.isa.org	
ISAS	Instrumentation, Systems, and Automation Society (The)	
	(See ISA)	
ISFA	International Surface Fabricators Association	(877) 464-7732
	(Formerly: International Solid Surface Fabricators Association)	(801) 341-7360
	www.isfanow.org	
ISO	International Organization for Standardization	41 22 749 01 11
	www.iso.org	
ISSFA	International Solid Surface Fabricators Association	
	(See ISFA)	
ITU	International Telecommunication Union	41 22 730 51 11
	www.itu.int/home	
KCMA	Kitchen Cabinet Manufacturers Association	(703) 264-1690
	www.kcma.org	
LMA	Laminating Materials Association	
	(See CPA)	

LPI	Lightning Protection Institute	(800) 488-6864
	www.lightning.org	
MBMA	Metal Building Manufacturers Association	(216) 241-7333
	www.mbma.com	
MCA	Metal Construction Association	(847) 375-4718
	www.metalconstruction.org	
MFMA	Maple Flooring Manufacturers Association, Inc.	(888) 480-9138
	www.maplefloor.org	
MFMA	Metal Framing Manufacturers Association, Inc.	(312) 644-6610
	www.metalframingmfg.org	
MHIA	Material Handling Industry of America	(800) 345-1815
	www.mhia.org	(704) 676-1190
MIA	Marble Institute of America	(440) 250-9222
	www.marble-institute.com	
MMPA	Moulding & Millwork Producers Association	(800) 550-7889
	(Formerly: Wood Moulding & Millwork Producers Association)	(530) 661-9591
	www.wmmpa.com	
MPI	Master Painters Institute	(888) 674-8937
	www.paintinfo.com	(604) 298-7578
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.	(703) 281-6613
	www.mss-hq.org	
NAAMM	National Association of Architectural Metal Manufacturers	(630) 942-6591
	www.naamm.org	
NACE	NACE International	(800) 797-6223
	(National Association of Corrosion Engineers International)	(281) 228-6200
	www.nace.org	
NADCA	National Air Duct Cleaners Association	(202) 737-2926
	www.nadca.com	

NAIMA	North American Insulation Manufacturers Association	(703) 684-0084
	www.naima.org	
NBGQA	National Building Granite Quarries Association, Inc.	(800) 557-2848
	www.nbgqa.com	
NCAA	National Collegiate Athletic Association (The)	(317) 917-6222
	www.ncaa.org	
NCMA	National Concrete Masonry Association	(703) 713-1900
	www.ncma.org	
NEBB	National Environmental Balancing Bureau	(301) 977-3698
	www.nebb.org	
NECA	National Electrical Contractors Association	(301) 657-3110
	www.necanet.org	
NeLMA	Northeastern Lumber Manufacturers Association	(207) 829-6901
	www.nelma.org	
NEMA	National Electrical Manufacturers Association	(703) 841-3200
	www.nema.org	
NETA	InterNational Electrical Testing Association	(888) 300-6382
	www.netaworld.org	(269) 488-6382
NFHS	National Federation of State High School Associations	(317) 972-6900
	www.nfhs.org	
NFPA	NFPA	(800) 344-3555
	(National Fire Protection Association)	(617) 770-3000
	www.nfpa.org	
NFRC	National Fenestration Rating Council	(301) 589-1776
	www.nfrc.org	
NHLA	National Hardwood Lumber Association	(800) 933-0318
	www.nhla.com	(901) 377-1818
NLGA	National Lumber Grades Authority	(604) 524-2393
	www.nlga.org	

NOFMA	National Oak Flooring Manufacturers Association	
	(See NWFA)	
NOMMA	National Ornamental & Miscellaneous Metals Association	(888) 516-8585
	www.nomma.org	
NRCA	National Roofing Contractors Association	(800) 323-9545
	www.nrca.net	(847) 299-9070
NRMCA	National Ready Mixed Concrete Association	(888) 846-7622
	www.nrmca.org	(301) 587-1400
NSF	NSF International	(800) 673-6275
	(National Sanitation Foundation International)	(734) 769-8010
	www.nsf.org	
NSPE	National Society of Professional Engineers	(703) 684-2800
	www.nspe.org	
NSSGA	National Stone, Sand & Gravel Association	(800) 342-1415
	www.nssga.org	(703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The)	(800) 323-9736
	www.ntma.com	
NWFA	National Wood Flooring Association	(800) 422-4556
	www.nwfa.org	(636) 519-9663
PCI	Precast/Prestressed Concrete Institute	(312) 786-0300
	www.pci.org	
PDI	Plumbing & Drainage Institute	(800) 589-8956
	www.pdionline.org	(978) 557-0720
PLASA	PLASA	(212) 244-1505
	(Formerly: ESTA - Entertainment Services and Technology Association)	
	www.plasa.org	
RCSC	Research Council on Structural Connections	

	www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute	(706) 882-3833
	www.rfci.com	
RIS	Redwood Inspection Service	(925) 935-1499
	www.redwoodinspection.com	
SAE	SAE International	(877) 606-7323
	(Society of Automotive Engineers)	(724) 776-4841
	www.sae.org	
SBCCI	Southern Building Code Congress International, Inc.	
	(See ICC)	
SCTE	Society of Cable Telecommunications Engineers	(800) 542-5040
	www.scte.org	(610) 363-6888
SDI	Steel Deck Institute	(847) 458-4647
	www.sdi.org	
SDI	Steel Door Institute	(440) 899-0010
	www.steeldoor.org	
SEFA	Scientific Equipment and Furniture Association	(877) 294-5424
	www.sefalabs.com	(516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers	
	(See ASCE)	
SIA	Security Industry Association	(866) 817-8888
	www.siaonline.org	(703) 683-2075
SJI	Steel Joist Institute	(843) 293-1995
	www.steeljoist.org	
SMA	Screen Manufacturers Association	(773) 636-0672
	www.smainfo.org	
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association	(703) 803-2980

	www.smacna.org	
SMPTE	Society of Motion Picture and Television Engineers	(914) 761-1100
	www.smpte.org	
SPFA	Spray Polyurethane Foam Alliance	(800) 523-6154
	www.sprayfoam.org	
SPIB	Southern Pine Inspection Bureau	(850) 434-2611
	www.spib.org	
SPRI	Single Ply Roofing Industry	(781) 647-7026
	www.spri.org	
SRCC	Solar Rating and Certification Corporation	(321) 638-1537
	www.solar-rating.org	
SSINA	Specialty Steel Industry of North America	(800) 982-0355
	www.ssina.com	(202) 342-8630
SSPC	SSPC: The Society for Protective Coatings	(877) 281-7772
	www.sspc.org	(412) 281-2331
STI	Steel Tank Institute	(847) 438-8265
	www.steeltank.com	
SWI	Steel Window Institute	(216) 241-7333
	www.steelwindows.com	
SWPA	Submersible Wastewater Pump Association	(847) 681-1868
	www.swpa.org	
TCA	Tilt-Up Concrete Association	(319) 895-6911
	www.tilt-up.org	
TCA	Tile Council of America (See TCNA)	
TCNA	Tile Council of North America, Inc.	(864) 646-8453
	(Formerly: Tile Council of America)	
	www.tileusa.com	
TEMA	Tubular Exchanger Manufacturers Association, Inc.	(914) 332-0040

	www.tema.org	
TIA	Telecommunications Industry Association	(703) 907-7700
	(Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance)	
	www.tiaonline.org	
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance	
	(See TIA)	
TMS	The Masonry Society	(303) 939-9700
	www.masonrysociety.org	
TPI	Truss Plate Institute	(703) 683-1010
	www.tpinst.org	
TPI	Turfgrass Producers International	(800) 405-8873
	www.turfgrasssod.org	(847) 649-5555
TRI	Tile Roofing Institute	(312) 670-4177
	www.tileroofing.org	
UBC	Uniform Building Code	
	(See ICC)	
UL	Underwriters Laboratories Inc.	(877) 854-3577
	www.ul.com	
UNI	Uni-Bell PVC Pipe Association	(972) 243-3902
	www.uni-bell.org	
USAV	USA Volleyball	(888) 786-5539
	www.usavolleyball.org	(719) 228-6800
USGBC	U.S. Green Building Council	(800) 795-1747
	www.usgbc.org	
USITT	United States Institute for Theatre Technology, Inc.	(800) 938-7488
	www.usitt.org	(315) 463-6463

WASTEC	Waste Equipment Technology Association	(800) 424-2869
	www.wastec.org	(202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau	(800) 283-1486
	www.wclib.org	(503) 639-0651
WCMA	Window Covering Manufacturers Association	(212) 297-2122
	www.wcmanet.org	
WDMA	Window & Door Manufacturers Association	(800) 223-2301
	www.wdma.com	(312) 321-6802
WI	Woodwork Institute	(916) 372-9943
	(Formerly: WIC - Woodwork Institute of California)	
	www.wicnet.org	
WMMPA	Wood Moulding & Millwork Producers Association	
	(See MMPA)	
WSRCA	Western States Roofing Contractors Association	(800) 725-0333
	www.wsrca.com	(650) 938-5441
WWPA	Western Wood Products Association	(503) 224-3930
	www.wwpa.org	

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

DIN	Deutsches Institut für Normung e.V.	49 30 2601-0
	www.din.de	
IAPMO	International Association of Plumbing and Mechanical Officials	(909) 472-4100
	www.iapmo.org	
ICC	International Code Council	(888) 422-7233
	www.iccsafe.org	
ICC-ES	ICC Evaluation Service, LLC	(800) 423-6587

	www.icc-es.org	(562) 699-0543

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

COE	Army Corps of Engineers	(202) 761-0011
	www.usace.army.mil	
CPSC	Consumer Product Safety Commission	(800) 638-2772
	www.cpsc.gov	(301) 504-7923
DOC	Department of Commerce	(301) 975-4040
	National Institute of Standards and Technology	
	www.nist.gov	
DOD	Department of Defense	(215) 697-2664
	http://dodssp.daps.dla.mil	
DOE	Department of Energy	(202) 586-9220
	www.energy.gov	
EPA	Environmental Protection Agency	(202) 272-0167
	www.epa.gov	
FAA	Federal Aviation Administration	(866) 835-5322
	www.faa.gov	
FG	Federal Government Publications	(202) 512-1800
	www.gpo.gov	
GSA	General Services Administration	(800) 488-3111
	www.gsa.gov	(202) 619-8925
HUD	Department of Housing and Urban Development	(202) 708-1112
	www.hud.gov	
LBL	Lawrence Berkeley National Laboratory	(510) 486-4000

	Environmental Energy Technologies Division	
	http://eetd.lbl.gov	
OSHA	Occupational Safety & Health Administration	(800) 321-6742
	www.osha.gov	
TRB	Transportation Research Board	(202) 334-2934
	National Cooperative Highway Research Program	
	www.trb.org	
USDA	Department of Agriculture	(202) 720-2791
	Rural Utilities Service	
	www.usda.gov	
USDJ	Department of Justice	(202) 307-0703
	Office of Justice Programs	
	National Institute of Justice	
	www.ojp.usdoj.gov	
USP	U.S. Pharmacopeia	(800) 227-8772
	www.usp.org	(301) 881-0666
USPS	United States Postal Service	(202) 268-2000
	www.usps.com	

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ABA /	Architectural Barriers Act	(800) 872-2253
ADA /	Americans with Disabilities Act	
ADAAG	Americans with Disabilities Act Accessibility Guidelines	
	Administered by the United States Access Board	
	http://www.access-board.gov/	
CFR	Code of Federal Regulations	(866) 512-1800

	Available from Government Printing Office	(202) 512-1800
	www.gpo.gov/fdsys	
DOD	Department of Defense	(215) 697-2664
	Military Specifications and Standards	
	Available from Department of Defense Single Stock Point	
	http://dodssp.daps.dla.mil	
FED-STD	Federal Standard	
	(See FS)	
FS	Federal Specification	(215) 697-2664
	Available from Department of Defense Single Stock Point	
	http://dodssp.daps.dla.mil	
	Available from Defense Standardization Program	
	www.dsp.dla.mil	
	Available from General Services Administration	(800) 488-3111
	www.gsa.gov	(202) 619-8925
	Available from National Institute of Building Sciences/Whole Building Design Guide	(202) 289-7800
	www.wbdg.org/ccb	
MILSPEC	Military Specification and Standards	
	(See DOD)	
TAS	Texas Accessibility Standards	(512) 539 5669
	Administered by the Texas Department of Licensing and Registration	
	http://www.tdlr.texas.gov/ab/ab.htm	
UFAS	Uniform Federal Accessibility Standards	(800) 872-2253
	Administered by the United States Access Board	
	http://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-aba-standards/ufas	
USAB	United States Access Board	(800) 872-2253
	www.access-board.gov	(202) 272-0080

USATBCB	U.S. Architectural & Transportation Barriers Compliance Board	
	(See USAB)	

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF	State of California	(800) 952-5210
	Department of Consumer Affairs	(916) 574-2041
	Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation	
	www.bearhfti.ca.gov	
CCR	California Code of Regulations	(916) 323-6225
	Office of Administrative Law	
	California Title 24 Energy Code	
	www.calregs.com	
CDHS	California Department of Health Care Services	
	(Formerly: California Department of Health Services)	
	(See CCR)	
CDPH	California Department of Public Health	
	Indoor Air Quality Program	
	www.cal-iaq.org	
CPUC	California Public Utilities Commission	(800) 848-5580
	www.cpuc.ca.gov	(415) 703-2782
SCAQMD	South Coast Air Quality Management District	(909) 396-2000
	www.aqmd.gov	
TCEQ	Texas Commission on Environmental Quality	(512) 239-1000
	http://www.tceq.state.tx.us/	
TDLR	Texas Department of Licensing and Registration	(800) 803-9202

	http://www.tdlr.texas.gov/index.htm	
TFS	Texas Forest Service	
	Forest Resource Development and Sustainable Forestry	(979) 458-6606
	http://txforestservice.tamu.edu	
TxDOT	Texas Department of Transportation	(800) 558-9368
	www.txdot.gov	

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01-4339 – MOCKUPS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. General requirements for mockups specified in other technical Sections.

B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 DEFINITIONS

A. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

B. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

1.03 SUBMITTALS

A. Mockup Shop Drawings: For integrated exterior wall and roofing mockups and integrated mockups of interior assemblies and finishes
   1. Provide plans, sections, and elevations, indicating materials and size of mockup construction.
   2. Indicate manufacturer and model number of individual components.
   3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.04 MOCKUPS

A. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect 7 days in advance of dates and times when mockups will be constructed.
   3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
   4. Demonstrate the proposed range of aesthetic effects and workmanship.
   5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
      a. Allow 7 days for initial review and each re-review of each mockup.
   6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   7. Demolish and remove mockups when directed unless otherwise indicated.

B. Mockup Pre-Installation Conference: Before beginning mock-up construction and installation, conduct conference with manufacturer’s representatives, fabricators, installers, Architect, Owner and other interested parties to review procedures, schedules, and coordination of curtain wall installation with other elements of Work.

C. Approved Mockups:
   1. Maintain approved in-place mockups during construction in an undisturbed condition as a standard for judging the completed Work.
      a. Approved mock-up assemblies built in-place may remain as part of final Work.

2. Maintain approved stand-alone mockup; do not disassemble or dispose of until so directed by Architect.
    a. Demolish and remove stand-alone mockups when directed, unless otherwise indicated.

D. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
1. Approved mock-up assemblies built in-place may remain as part of final Work.
2. Demolish and remove mock-ups when directed, unless otherwise indicated.
3. Mock-up shall remain on site and shall not be removed, disassembled, or disposed of until so directed by Architect.

1.05 MOCKUP TESTING

A. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements, comply with requirements specified in individual technical Sections and with the following:
1. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
2. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
3. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
4. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
5. Provide test specimens representative of proposed products and construction.
6. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
7. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
8. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
9. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
10. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.

B. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

C. Representatives of Architect's office and representatives of Owner's office will be present to observe preparation for testing and testing procedures.
1. Notify Architect in advance of testing.

D. Testing of Mockups: Conduct tests in accordance with test procedures specified in individual specification Sections.

PART 2 - PRODUCTS

Not Used.

PART 3 - MOCKUP SCHEDULE

3.01 INTEGRATED EXTERIOR WALL MOCKUP

A. General: Construct integrated exterior mockup according to approved Mockup Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with other supporting materials.

B. Mockup Shop Drawings and Mockup Pre-Installation Conference: As specified herein.

C. Size: As indicated on approved Mockup Shop Drawings, and as follows:
1. Width: 8'-0" wide, minimum.
2. Height: Minimum truncated height required to include all elements of full-height wall.

D. Scope: Construct integrated mockup of partial exterior wall and roofing systems as indicated on the drawings and/or as specified. Mockup to include but not limited to the following wall assembly elements:
   1. Back-Up Structure: Masonry back-up wall, including the following:
      a. Fiberglass-faced gypsum sheathing
      b. Continuous air barrier, tie-in to other components.
      c. Insulation
      d. Through-wall flashing and weeps.
   2. Masonry Veneer: Including the following:
      a. Face brick veneer, pigmented mortar joints, bond pattern.
      b. Sealant joints
      c. Cast stone sill
   3. Glazed Opening: Including the following:
      a. Aluminum storefront, anchors and flashing.
      b. Glass and glazing materials.
      c. Sealant joints
      d. Field-Testing: For air and water infiltration, in accordance with Division 01 requirements.

3.02 OTHER MOCKUPS

A. In addition to previous items, construct field (project site) mock-ups and samples for review where indicated in individual Specifications Sections.

3.03 INSTALLATION

A. Installation: Construct mock-ups for Architect's visual examination, for quality control, and performance of required testing. Use materials, fabrication and installation methods identical with those indicated for Work. Simulate surrounding conditions as closely as possible.
   1. Construct mockups for Architect's visual examination, for quality control and quality of installation.
      a. Demonstrate the proposed range of aesthetic effects and workmanship.
      b. Build mockups of size indicated in Drawings.
      c. Use materials, fabrication and installation methods identical with those indicated for Work.
      d. Simulate surrounding conditions as closely as possible.
   2. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
   3. Install mockups under manufacturer's direct supervision employing workmen who will be used during actual erection at job site.

END OF SECTION 01 43 39

SECTION 01-5000 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
B. Temporary utilities include, but are not limited to, the following:
   1. Sewers and drainage.
   2. Water service and distribution.
   3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
   4. Heating and cooling facilities.
   5. Ventilation.
   6. Electric power service.
   7. Lighting.
   8. Telephone service.
C. Support facilities include, but are not limited to, the following:
   1. Temporary roads and paving.
   2. Dewatering facilities and drains.
   3. Project identification and temporary signs.
   4. Waste disposal facilities.
   5. Field offices.
   6. Storage and fabrication sheds.
   7. Lifts and hoists.
   8. Temporary elevator usage.
   9. Temporary stairs.
   10. Construction aids and miscellaneous services and facilities.
D. Security and protection facilities include, but are not limited to, the following:
   1. Environmental protection.
   2. Stormwater control.
   3. Tree and plant protection.
   4. Pest control.
   5. Site enclosure fence.
   6. Security enclosure and lockup.
   7. Barricades, warning signs, and lights.
   8. Covered walkways.
   9. Temporary enclosures.
   10. Temporary partitions.
   11. Fire protection.
E. Related Sections include the following:

1. Division 1 Section - Submittal Procedures for procedures for submitting copies of implementation and termination schedule and utility reports.
2. Division 1 Section - Execution Requirements for progress cleaning requirements.
3. Divisions 2 through 48 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.03 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.04 USE CHARGES

A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
   1. Owner's maintenance personnel.
   2. Occupants of Project.
   3. Architect.
   4. Testing agencies.
   5. Personnel of authorities having jurisdiction.
B. Sewer Service: Pay sewer service use charges for sewer usage, by all parties engaged in construction, at Project site.
C. Water Service: Use water from Owner's existing water system without metering and without payment of use charges.
D. Water Service: Pay water-service use charges for water used by all entities for construction operations.
E. Water and Sewer Service from Existing System: Owner's existing water & sewer systems are available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations
F. Electric Power Service: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
G. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.05 SUBMITTALS

A. Temporary Utility Reports: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

1.06 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
   1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
   2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.07 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
   1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
   1. Keep temporary services and facilities clean and neat.
   2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.

C. Wood Enclosure Fence: Plywood, [6 feet] [8 feet] high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.

D. Portable Chain-Link Fencing: Minimum 2-inch 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide concrete or galvanized steel bases for supporting posts.

E. Lumber and Plywood: Comply with requirements in Division 6 Section - Carpentry.

F. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36.

G. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively.

H. Paint: Comply with requirements in Division 9 Section - Painting.

I. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

J. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

K. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches

L. Water: Potable.

2.02 EQUIPMENT

A. General: Provide equipment suitable for use intended.

B. Field Offices: Prefabricated Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.

C. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
   1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
   2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one

receptacle on each wall. Furnish room with conference table, chairs, and tack & marker boards.
3. Drinking water and private toilet.
4. Coffee machine and supplies.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
6. Lighting fixtures capable of maintaining average illumination of 20 fc.

D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations. Store combustible materials apart from building.

E. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

F. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

G. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.
1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

H. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of [8] at each return-air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section - Closeout Procedures.

I. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

J. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the

remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.
3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.

B. Water Service: Provide temporary water service as required for construction.

1. Provide rubber hoses as necessary to serve Project site.
2. Install water service and distribution piping in sizes and pressures adequate for construction.
3. As soon as water is required at each level, extend service to form a temporary water- and fire-protection standpipe. Provide distribution piping. Space outlets so water can be reached with a 100-foot (30-m) hose. Provide one hose at each outlet.
4. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
5. Provide pumps to supply a minimum of 30-psi static pressure at highest point. Equip pumps with surge and storage tanks and automatic controls to supply water uniformly at reasonable pressures.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities. Existing sanitary facilities and new sanitary facilities shall not be used by contractor personnel.

1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Provide separate facilities for male and female personnel.
3. Toilets: Install toilet facilities connected to local water and sewer lines. Provide lavatories, mirrors, urinals, and water closets. Provide only potable-water connections. Provide individual compartments for water closets. Provide suitable enclosure with nonabsorbent sanitary finish materials and adequate heat, ventilation, and lighting.
4. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
5. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel who handle materials that require wash up. Dispose of drainage properly. Supply cleaning compounds appropriate for each type of material handled.
    a. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
6. Drinking-Water Facilities: Provide bottled-water, drinking-water units.
    a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.

1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.

E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

F. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

G. Electric Distribution: Provide temporary electric power service as required for construiction, incluing receptacle outlets adequate for connection of power tools and equipment.
   1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
   2. Provide warning signs at power outlets other than 110 to 120 V.
   3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
   4. Provide metal conduit enclosures or boxes for wiring devices.
   5. Provide 4-gang outlets, spaced so 100-foot extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
   2. Provide one 100-W incandescent lamp per 500 sq. ft., uniformly distributed, for general lighting, or equivalent illumination.
   3. Provide one 100-W incandescent lamp every 50 feet in traffic areas.
   4. Provide one 100-W incandescent lamp per story in stairways and ladder runs, located to illuminate each landing and flight.
   5. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.
   6. Install lighting for Project identification sign.

I. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office and first-aid station.
   1. Provide additional telephone lines for the following:
      a. In field office with more than two occupants, install a telephone for each additional occupant or pair of occupants.
      b. Provide a dedicated telephone line for each facsimile machine and computer with Internet connection in the field office.
   2. At each telephone, post a list of important telephone numbers.
      a. Police and fire departments.
      b. Ambulance service.
      c. Contractor's home office.
      d. Architect's office.
      e. Engineers' offices.
      f. Owner's office.
      g. Principal subcontractors' field and home offices.
   3. Provide an answering machine, voice-mail service, or messaging service on superintendent's telephone.

4. Furnish superintendent with a portable cellular telephone for use in making and receiving telephone calls when away from field office.

J. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Contractor, Architect and Owner to access Project electronic documents and maintain electronic communications. Equip computer with not less than the following:
   1. Processor: Intel Quad-Core, 4.0 GHz processing speed.
   2. Memory: 4 gigabyte.
   3. Disk Storage: 300 gigabyte hard-disk drive and combination DVD-RW/CD-RW drive.
   4. Display: 22-inch LED monitor with 256-Mb dedicated video RAM.
   5. Full-size keyboard and mouse.
   6. Network Connectivity: 10/100BaseT Ethernet.
   7. Operating System: Microsoft Windows 8.1 or higher.
   8. Productivity Software:
      a. Microsoft Office, including Word, Excel, and Outlook.
      b. Adobe Reader 11.0 or higher.
      c. WinZip 17.0 or higher.
   9. Printer: "All-in-one" unit equipped with printer server, combining color printing, photocopying, scanning, or separate units for each of these functions.
   10. Internet Service: Broadband modem, router and ISP, equipped with hardware firewall, providing minimum 25 Mbps upload and 25 Mbps download speeds at each computer.
   11. Internet Security: Integrated software, providing software firewall, virus, spyware, phishing, and spam protection in a combined application.
   12. Backup: External hard drive, minimum 80 gigabyte, with automated backup software providing daily backups.

K. Digital Camera: Provide a digital camera for superintendant to transmit photographs to Architect & Owner.

3.03 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
   2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
   3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.

C. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas [as indicated] [within construction limits indicated] on Drawings.
   1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.

D. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
   1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
   2. Prepare subgrade and install sub-base and base for temporary roads and paved areas according to Division 31 Section - Earth Moving.

3. Recondition base after temporary use, including removing contaminated material, re-grading, proof-rolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section - Asphalt Paving.

E. Dewatering Facilities and Drains: Comply with requirements in applicable sections for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.
2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.
3. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.
1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated.
2. Prepare temporary signs to provide directional information to construction personnel and visitors.
3. Construct signs of exterior-type Grade B-B high-density concrete-form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.
4. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.
5. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section - Execution Requirements for progress cleaning requirements. Comply with requirements specified in Division 1 Section - Construction Waste Management and Disposal.
1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

H. Janitorial Services: Provide janitorial services on a daily basis for temporary offices, first-aid stations, toilets, wash facilities, lunchrooms, and similar areas.

I. Common-Use Field Office: Provide an insulated, weathertight, air-conditioned field office for use as a common facility by all personnel engaged in construction activities; of sufficient size to accommodate required office personnel and meetings of 10 persons at Project site. Keep office clean and orderly.
1. Furnish and equip offices as follows:
   a. Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.
   b. Water cooler and private toilet complete with water closet, lavatory, and medicine cabinet with mirror.
   c. Provide a room of not less than 240 sq. ft. for Project meetings. Furnish room with conference table, 12 folding chairs, and 4-foot- square tack board.

2. Provide an electric heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F. Provide an air-conditioning unit capable of maintaining an indoor temperature of 72 deg F.
3. Provide fluorescent light fixtures capable of maintaining average illumination of 20 fc at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot intervals, 1 per wall in each room.

J. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.
1. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.
2. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer.

K. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
1. Existing Elevator Usage: Use of Owner's existing elevators will be not be permitted.

L. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

M. Existing Stair Usage: Use of Owner's existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Temporary Erosion and Sedimentation Control: Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Division 31 Section - Site Clearing.

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion and sedimentation control drawings or requirements of authorities having jurisdiction, whichever is more stringent.
1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.
F. Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest-control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Engage this pest-control service to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
G. Site Enclosure Fence: Before construction operations begin, install chain-link enclosure fence with lockable entrance gates. Locate where indicated, or enclose entire Project site or portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering site except by entrance gates.
    1. Set fence posts in concrete bases.
    2. Provide gates in sizes and at locations necessary to accommodate delivery vehicles and other construction operations.
    3. Option in subparagraph below is only for projects connected to existing construction.
    4. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.
H. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each day.
I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
J. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.
    1. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch thick exterior plywood.
K. Covered Walkway: Erect a structurally adequate, protective, covered walkway for passage of persons where proximity of construction to occupied facilities requires. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
    1. Construct covered walkways using scaffold or shoring framing.
    2. Provide wood-plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
    3. Extend back wall beyond the structure to complete enclosure fence.
    4. Paint and maintain in a manner approved by Owner and Architect.
    5. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8-inch thick exterior plywood.
L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
    1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
    2. Vertical Openings: Close openings of 25 sq. ft.or less with plywood or similar materials.
    3. Horizontal Openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.

4. Install tarpaulins securely using fire-retardant-treated wood framing and other materials.
5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use fire-retardant-treated material for framing and main sheathing.

M. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise. Prevent from entering occupied areas.
1. Construct dustproof partitions of not less than nominal 4-inch studs, 5/8-inch gypsum wallboard with joints taped on occupied side, and 1/2-inch fire-retardant plywood on construction side.
2. Construct dustproof, floor-to-ceiling partitions of not less than nominal 4-inchstuds, 2 layers of 3-milpolyethylene sheets, inside and outside temporary enclosure. Cover floor with 2 layers of 3-mil polyethylene sheets, extending sheets 18 inchesup the side walls. Overlap and tape full length of joints. Cover floor with 3/4-inchfire-retardant plywood.
   a. Construct a vestibule and airlock at each entrance to temporary enclosure with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
3. Insulate partitions to provide noise protection to occupied areas.
4. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
   a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
   b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
5. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
6. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
7. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
8. Protect air-handling equipment.
9. Weatherstrip openings.

N. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
   a. Field Offices: Class A stored-pressure water-type extinguishers.
   b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
   c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Provide temporary key boxes and knox padlocks for gates and secured areas throughout construction as required by authorities having jurisdiction.
4. Prohibit smoking in construction areas.
5. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
6. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

7. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
8. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
9. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.05 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
   1. Protect porous materials from water damage.
   2. Protect stored and installed material from flowing or standing water.
   3. Keep porous and organic materials from coming into prolonged contact with concrete.
   4. Remove standing water from decks.
   5. Keep deck openings covered or dammed.
C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Periodically collect and remove waste containing cellulose or other organic matter.
   4. Discard or replace water-damaged material.
   5. Do not install material that is wet.
   6. Discard, replace, or clean stored or installed material that begins to grow mold.
   7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Use permanent HVAC system to control humidity.
   3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits:
      a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
      b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
      c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.06 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
   2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
D. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
   3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section - Closeout Procedures.

END OF SECTION 01 50 00

SECTION 01-6000 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. This Section includes the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.
B. Related Sections include the following:
   1. Division 1 Section - Allowances for products selected under an allowance.
   2. Division 1 Section - Alternates for products selected as an alternate.
   3. Division 1 Section - Substitutions for products selected as a substitute.
   4. Division 1 Section - References for applicable industry standards for products specified.
   5. Division 1 Section - Closeout Procedures for submitting warranties for contract closeout.
   6. Divisions 2 - 48 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.03 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-

service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.04 SUBMITTALS

A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
   1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
   2. Form: Tabulate information for each product under the following column headings:
      a. Specification Section number and title.
      b. Generic name used in the Contract Documents.
      c. Proprietary name, model number, and similar designations.
      d. Manufacturer's name and address.
      e. Supplier's name and address.
      f. Installer's name and address.
      g. Projected delivery date or time span of delivery period.
      h. Identification of items that require early submittal approval for scheduled delivery date.
   3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
      a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
   4. Completed List: Within 30 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
   5. Architect's Action: Architect will respond in writing to Contractor within 15 working days of receipt of completed product list if there are objections to the list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section - Submittal Procedures. Show compliance with requirements.

1.05 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
   1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
   2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
   5. Store products to allow for inspection and measurement of quantity or counting of units.
   6. Store materials in a manner that will not endanger Project structure.
   7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   8. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
   9. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   10. Protect stored products from damage and liquids from freezing.
   11. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.07 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Refer to Divisions 2 through 48 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section - Closeout Procedures.

PART 2 - PRODUCTS

2.01 PRODUCT OPTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
7. Or Equal: Where products are specified by name and accompanied by the term "or equal", "or approved equal", "or approved," or “acceptable substitution”, comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures: Procedures for product selection include the following:
1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
   a. Substitutions may be considered, unless otherwise indicated.
2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
   a. Substitutions may be considered, unless otherwise indicated.
3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
   a. Substitutions may be considered, unless otherwise indicated.
4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
   a. Substitutions may be considered, unless otherwise indicated.
5. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
7. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in "Product Substitutions" Article.
8. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
   a. Substitutions may be considered, unless otherwise indicated.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and

matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.

a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on "substitutions" for selection of a matching product.

10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
11. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

2.02 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
    1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
    2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
    3. Evidence that proposed product provides specified warranty.
    4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
    5. Samples, if requested.

PART 3 - EXECUTION

Not Used.

END OF SECTION 01 60 00

SECTION 01-7300 – EXECUTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. Installation of the Work.
   4. Cutting and patching.
   5. Coordination of Owner-installed products.
   6. Progress cleaning.
   7. Starting and adjusting.
   8. Protection of installed construction.
   9. Correction of the Work.

B. Related Requirements:
   1. Division 01 Section - Summary for limits on use of Project site.
   2. Division 01 Section - Submittal Procedures for submitting surveys.
   3. Division 01 Section - Cutting and Patching for cutting and patching necessary for installation or performance of other components of the work.
   4. Division 01 Section - Closeout Procedures for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
   5. Division 02 Section - Selective Structure Demolition for demolition and removal of selected portions of the building.
   6. Division 07 Section - Penetration Firestopping for patching penetrations in fire-rated construction.

1.03 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.
B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
    1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
    2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
    3. Products: List products to be used for patching and firms or entities that will perform patching work.
    4. Dates: Indicate when cutting and patching will be performed.
    5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
        a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
E. Certified Surveys: Submit two hard copies and one electronic copy signed by land surveyor.
F. Final Property Survey: Submit 4 hard copies and one electronic copy showing the Work performed and record survey data.

1.05 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
    1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
    2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
        a. Primary operational systems and equipment.
        b. Fire separation assemblies.
        c. Air or smoke barriers.
        d. Fire-suppression systems.
        e. Mechanical systems piping and ducts.
        f. Control systems.
        g. Communication systems.
        h. Fire detection and alarm systems.
        i. Conveying systems.
        j. Electrical wiring systems.
        k. Operating systems of special construction.
    3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance

or decreased operational life or safety. Other construction elements include but are not limited to the following:
a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Sprayed fire-resistive material.
d. Equipment supports.
e. Piping, ductwork, vessels, and equipment.
f. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Comply with requirements specified in other Sections.
1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements in Division 01 sustainable design requirements Section.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
3. In the event of any inconsistency or conflict, between existing conditions and the bidding documents, immediate notice of such inconsistency or conflict shall be given to the Architect. Do not undertake any phase of the work affected by such inconsistency or conflict, pending the issuance of instructions by the Architect.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   1. Description of the Work.
   2. List of detrimental conditions, including substrates.
   3. List of unacceptable installation tolerances.
   4. Recommended corrections.
D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Owner not less than five days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's written permission.
C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section - Project Management and Coordination.

3.03 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
   2. Establish limits on use of Project site.
   3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   4. Inform installers of lines and levels to which they must comply.

5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Elevations of existing grades, floors, tops of walls, parapets, beams and locations of existing columns, walls and the like are based on survey documents or on drawings of the existing building furnished by the Owner. The Architect assumes no responsibility for the accuracy of the information on existing drawings. It is the intent of the Contract Drawings to integrate new work with existing improvements and for the Contractor to verify actual conditions.

E. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

F. Subcontractors shall verify with the General Contractor the exact field location of all rough-in dimensions, taking into account location of walls, partitions and equipment. Special attention should be paid to clearances as required for compliance with American's with Disabilities Act Accessibility Guidelines (ADAAG) in the state having jurisdiction, including any applicable revisions. Any cost in relocation of items due to that subcontractor's error, will be borne by him at no additional cost to the Owner.

G. Where equipment involving more than one subcontractor is installed at a common location and no specific location has been determined, it is the Contractor's responsibility to check with the Architect for the actual rough-in dimensions for such equipment. If for some reason the rough-in has not been checked and a subcontractor has installed his equipment, remaining subcontractors shall align their equipment as closely as possible to the installed equipment. Alignment shall mean centered vertically, equally space and centered horizontally. This alignment applies to bells, alarms, thermostats, switches, handles, access panels, etc. Any items not installed in alignment shall be relocated by the Contractor at his own expense with damaged surfaces properly repaired.

H. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.04 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.05 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inch in occupied spaces and 90 inch in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.06 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Division 01 Section - Summary.

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original condition.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall

coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.07 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.
B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
   1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
   2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.08 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Use containers intended for holding waste materials of type to be stored.
   4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
B. Site: Maintain Project site free of waste materials and debris.
C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section - Temporary Facilities.
H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.09 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section - General Commissioning Requirements.
B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section - Quality Requirements.

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
B. Comply with manufacturer's written instructions for temperature and relative humidity.
C. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section - Cutting and Patching.
    1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
D. Restore permanent facilities used during construction to their specified condition.
E. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
F. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
G. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

01-7329 – CUTTING AND PATCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. This Section includes procedural requirements for cutting and patching.
B. Related Sections include the following:
   1. Division 2 Section - Selective Demolition for demolition of selected portions of the building for alterations.
   2. Divisions 2 through 48 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
      a. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 21, 22, 23, 25, 26, 27 and 28 Sections for other requirements and limitations applicable to cutting and patching plumbing, mechanical and electrical installations.

1.03 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.04 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
   1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
   2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
   3. Products: List products to be used and firms or entities that will perform the Work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.05 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
   1. Primary operational systems and equipment.
   2. Air or smoke barriers.
   3. Fire-protection systems.
   4. Control systems.
   5. Communication systems.
   6. Electrical wiring systems.
   7. Operating systems of special construction in Division 13 Sections.
C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
   1. Water, moisture, or vapor barriers.
   2. Membranes and flashings.
   3. Exterior curtain-wall construction.
   4. Equipment supports.
   5. Piping, ductwork, vessels, and equipment.
   6. Noise- and vibration-control elements and systems.
D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.06 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.
B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.03 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Division 31, 32 & 33 Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as

invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 01 73 29

SECTION 01-7700 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

B. Related Requirements:
   1. Division 01 - Substantial Completion Readiness Checklist.
   2. Division 01 Section - Photographic Documentation for submitting final completion construction photographic documentation.
   3. Division 01 Section - Execution Requirements for progress cleaning of Project site.
   4. Division 01 Section - Operation and Maintenance Data for operation and maintenance manual requirements.
   5. Division 01 Section - Project Record Documents for submitting record Drawings, record Specifications, and record Product Data.
   6. Division 01 Section - Demonstration and Training for requirements for instructing Owner's personnel.
   7. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.03 QUALITY CONTROL

A. Closeout Conference: Schedule and conduct a closeout conference, to be held one to three months prior to the anticipated date of substantial completion. Required attendees include Contractor’s on-site personnel and Project Manager, Architect, and designated Owner’s representative(s). Discuss any items that could impede progress to scheduled date of substantial completion, closeout procedures, and the following:
   1. Any pending or anticipated time extension requests that may affect the projected date of Substantial Completion.
   2. Progress or scheduled progress of Contractor’s preparation of project record documents.
   3. Current status of Contractor’s As-Built documents, and plans to address any deficiencies.
   4. Required Owner training, and process for scheduling training with Owner’s staff.
   5. Required submittals to Architect prior to requesting inspection for Substantial Completion, including the Substantial Completion Readiness Checklist.
   6. Requirements for testing and balancing and for submitting Test / Adjust / Balance reports.
   7. Commissioning.

8. Maximum time allowed between Substantial and Final Completion, and Contractor’s plan to ensure that all incomplete work is completed on schedule.
9. Written action plans required to address deficiencies (if any).

B. Contractor shall record Closeout Conference minutes, including all Contractor’s action items, and distribute to attendees within one week. Contractor shall attach plans to address deficiencies for any items identified in the Closeout Conference that require a written action plan.

1.04 ACTION SUBMITTALS

A. Product Data: For cleaning agents.
B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
C. Substantial Completion Readiness Checklist form: Fully filled out, submitted prior to or concurrent with requesting a date for substantial completion. See attached form.
D. Certified List of Incomplete Items: Final submittal at Final Completion.

1.05 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.
B. Certificate of Insurance: For continuing coverage.
C. Field Report: For pest control inspection.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.07 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   2. Submit a fully filled out Substantial Completion Readiness Checklist (see attachment to this specification Section).
   3. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
   4. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   5. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
      a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
   6. Submit test/adjust/balance records.

7. Submit sustainable design submittals required in Division 01 sustainable design requirements Section and in individual Division 02 through 33 Sections.
8. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Review the Substantial Completion Readiness Checklist form (attached). Address habitual punch list items to the extent possible and note remaining items in Contractor's List of Incomplete Items. Ensure that other items indicated on the Checklist can or will be complete by the required dates and note any deficiencies on the checklist form prior to submitting it to Architect.
2. Advise Owner of pending insurance changeover requirements.
3. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
4. Complete startup and testing of systems and equipment.
5. Perform preventive maintenance on equipment used prior to Substantial Completion.
6. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section - Demonstration and Training.
7. Advise Owner of changeover in heat and other utilities.
8. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
10. Complete final cleaning requirements, including touchup painting.
11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.08 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section - Payment Procedures.
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection

or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.09 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of Architect.
      d. Name of Contractor.
      e. Page number.
   4. Submit list of incomplete items in the following format:
      a. PDF electronic file. Architect will return annotated file.

1.10 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize entire collection of approved warranty documents into an orderly sequence based on the table of contents of Project Manual, with tabs between CSI division sections; i.e.; group all Division-7 building components under one tab, group all Division-8 components under another tab, etc.. Utilize CSI specification sections 2 through 33 for each division tab. Provide three copies of each Final Warranty binder.
   1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
   2. Provide title page, Contractor’s general One-Year Warranty (corrective period) with agreed upon date and signature of authorized representative, table of contents, and subcontractor list at the beginning of each binder.
   3. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   4. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
   5. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals. Such copies shall be identical to the warranties included in the warranty binders, but may be photocopies including for warranties that require wet signatures for the original actuated copies.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.01 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.
    l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

q. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Division 01 Section - Temporary Facilities and Controls. Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section - Temporary Facilities and Controls.

E. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

F. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
   a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 01-7823 – OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory.
   2. Emergency manuals.
   3. Operation manuals for systems, subsystems, and equipment.
   4. Product maintenance manuals.
   5. Systems and equipment maintenance manuals.

B. Related Requirements:
   1. Division 01 Section - Multiple Contract Summary for coordinating operation and maintenance manuals covering the Work of multiple contracts.
   2. Division 01 Section - Submittal Procedures for submitting copies of submittals for operation and maintenance manuals.
   3. Division 01 Section - General Commissioning Requirements for verification and compilation of data into operation and maintenance manuals.
   4. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.03 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.04 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:
   1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit three Final copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.02 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Subcontractor list
4. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.

8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Subcontractor List: Organize subcontractor list by CSI specification section, as listed in the Project Manual table of contents. Provide contact name, street address (no P.O. Box numbers) and contact phone and fax number. If changes were made during the course of the project, utilize final contract company for each component of the work. List all contractors used on project, even if subcontracted to a different subcontractor, i.e; if earthwork subcontractor is contracted by the paving subcontractor, list both subcontractors.

E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
   2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
   1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom **of spine**. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
   4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
   5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.03 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:
   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.
B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
   1. Fire.
   2. Flood.
   3. Gas leak.
   4. Water leak.
   5. Power failure.
   6. Water outage.
   7. System, subsystem, or equipment failure.
   8. Chemical release or spill.
C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
D. Emergency Procedures: Include the following, as applicable:
   1. Instructions on stopping.
   2. Shutdown instructions for each type of emergency.
   3. Operating instructions for conditions outside normal operating limits.
   4. Required sequences for electric or electronic systems.
   5. Special operating instructions and procedures.

2.04 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
   1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
   2. Performance and design criteria if Contractor has delegated design responsibility.
   3. Operating standards.
   4. Operating procedures.
   5. Operating logs.
   6. Wiring diagrams.
   7. Control diagrams.
   8. Piped system diagrams.
   9. Precautions against improper use.
   10. License requirements including inspection and renewal dates.
B. Descriptions: Include the following:
   1. Product name and model number. Use designations for products indicated on Contract Documents.
   2. Manufacturer's name.
   3. Equipment identification with serial number of each component.

4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.05 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Bonds: Include copies of bonds and lists of circumstances and conditions that would affect validity of bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.06 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures,

maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

PART 3 - EXECUTION

3.01 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
   1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
   1. Do not use original project record documents as part of operation and maintenance manuals.
   2. Comply with requirements of newly prepared record Drawings in Division 01 Section - Project Record Documents.

G. Comply with Division 01 Section - Closeout Procedures for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01-7839 – PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

B. Related Requirements:
   1. Division 01 Section - Multiple Contract Summary for coordinating project record documents covering the Work of multiple contracts.
   2. Division 01 Section - Execution for final property survey.
   3. Division 01 Section - Closeout Procedures for general closeout procedures.
   4. Division 01 Section - Operation and Maintenance Data for operation and maintenance manual requirements.
   5. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.03 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit one set of marked-up record prints.
   2. Number of Copies: Submit copies of record Drawings as follows:
      a. Initial Submittal:
         1) Submit one paper-copy set(s) of marked-up record prints.
         2) Submit PDF electronic files of scanned record prints and one of file prints.
         3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal:
         1) Submit PDF electronic files of scanned record prints and three set(s) of prints.
         2) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy and annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities.

Submit annotated PDF electronic files and directories of each submittal. Unless more stringent requirements are called for in other related specifications, include the following:

1. (2) copies of irrigation system laminated zone map and scanned electronic file in PDF or JPEG format.
2. Electronic copy of Contractor's meeting minutes, and of A/E's field reports.
3. Electronic copy of Addenda.
4. Electronic copy of Architect's Supplemental Instructions.
5. Electronic copy of Change Orders, Contingency Expenditures, Change Directives, and similar contract modifications.
6. Electronic copy of Requests For Information.
7. Electronic copy of transmittals for extra and maintenance materials, signed by Owner's representatives who received them.
8. Attendance sign-in lists for training sessions.

E. Reports: Submit written report indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Accurately record information in an acceptable drawing technique.
   c. Record data as soon as possible after obtaining it.
   d. Record and check the markup before enclosing concealed installations.
   e. Cross-reference record prints to corresponding archive photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made by Change Order or Construction Change Directive.
   k. Changes made following Architect's written orders.
   l. Details not on the original Contract Drawings.
   m. Field records for variable and concealed conditions.
   n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
   1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
   2. Format: DWG, Version 2013, Microsoft Windows operating system.
   3. Format: Annotated PDF electronic file.
   4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
   5. Refer instances of uncertainty to Architect for resolution.
   6. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
      a. See Division 01 Section "Submittal Procedures" for requirements related to use of Architect's digital data files.
      b. Architect will provide data file layer information. Record markups in separate layers.

C. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
   1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
   2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

D. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
   1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
   2. Format: Annotated PDF electronic file [with comment function enabled].
   3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
   4. Identification: As follows:
      a. Project name.
      b. Date.
      c. Designation "PROJECT RECORD DRAWINGS."
      d. Name of Architect.
      e. Name of Contractor.

2.02 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3. Record the name of manufacturer, supplier, installer, and other information necessary to provide a record of selections made.
   4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
   5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as annotated PDF electronic file.

2.03 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders, record Specifications, and record Drawings where applicable.
B. Format: Submit record Product Data as annotated PDF electronic file.
   1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.04 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
B. Format: Submit miscellaneous record submittals as PDF electronic file.
   1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.01 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01-7900 – DEMOSTRATION AND TRAINING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Division Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.
   3. Demonstration and training video recordings.

B. Related Requirements:
   1. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

C. Allowances: Furnish demonstration and training instruction time under the Demonstration and Training Allowance as specified in Division 01 Section "Allowances."

D. Unit Price for Instruction Time: Length of instruction time will be measured by actual time spent performing demonstration and training in required location. No payment will be made for time spent assembling educational materials, setting up, or cleaning up. See requirements in Division 01 Section "Unit Prices."

1.03 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For facilitator.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.04 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
   1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Date of video recording.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
4. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.
D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
   1. Inspect and discuss locations and other facilities required for instruction.
   2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
   3. Review required content of instruction.
   4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.06 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.01 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
    1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
        a. System, subsystem, and equipment descriptions.
        b. Performance and design criteria if Contractor is delegated design responsibility.
        c. Operating standards.
        d. Regulatory requirements.
        e. Equipment function.
        f. Operating characteristics.
        g. Limiting conditions.
        h. Performance curves.
    2. Documentation: Review the following items in detail:
        a. Emergency manuals.
        b. Operations manuals.
        c. Maintenance manuals.
        d. Project record documents.
        e. Identification systems.
        f. Warranties and bonds.
        g. Maintenance service agreements and similar continuing commitments.
    3. Emergencies: Include the following, as applicable:
        a. Instructions on meaning of warnings, trouble indications, and error messages.
        b. Instructions on stopping.
        c. Shutdown instructions for each type of emergency.
        d. Operating instructions for conditions outside of normal operating limits.
        e. Sequences for electric or electronic systems.
        f. Special operating instructions and procedures.
    4. Operations: Include the following, as applicable:
        a. Startup procedures.
        b. Equipment or system break-in procedures.
        c. Routine and normal operating instructions.
        d. Regulation and control procedures.
        e. Control sequences.
        f. Safety procedures.
        g. Instructions on stopping.
        h. Normal shutdown instructions.
        i. Operating procedures for emergencies.
        j. Operating procedures for system, subsystem, or equipment failure.
        k. Seasonal and weekend operating instructions.
        l. Required sequences for electric or electronic systems.
        m. Special operating instructions and procedures.
    5. Adjustments: Include the following:
        a. Alignments.
        b. Checking adjustments.
        c. Noise and vibration adjustments.
        d. Economy and efficiency adjustments.
    6. Troubleshooting: Include the following:
        a. Diagnostic instructions.
        b. Test and inspection procedures.

7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.01 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."
B. Set up instructional equipment at instruction location.

3.02 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
   2. Owner will furnish an instructor to describe Owner's operational philosophy.
   3. Owner will furnish Contractor with names and positions of participants.
C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
   1. Schedule training with Owner, with at least seven days' advance notice.
D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral performance-based test.
F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.03 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.
   1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
   2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
   3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
   4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
      a. Name of Contractor/Installer.
      b. Business address.
      c. Business phone number.
      d. Point of contact.
      e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
   1. Film training session(s) in segments not to exceed 15 minutes.
      a. Produce segments to present a single significant piece of equipment per segment.
      b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
      c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
   1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 79 00

SECTION 01-8133 – STORM SHELTER QUALITY ASSURANCE PLAN

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Quality Assurance Plan for ICC-500 Storm Shelters. Refer also to notes and additional information in Drawings.
   2. Contractor's responsibilities for Storm Shelter quality control.

B. Related Sections include the following:
   1. Divisions 03 and 05, as applicable for structural shell.
   2. Division 07, Penetration Firestopping.
   3. Division 07, Expansion Control, for joint covers for structural isolation joints.
   4. Division 08, storm rated protective systems for openings through storm rated structure.
   5. Division 10, Signage, for required signage for storm shelters.
   6. Division 10, Fire Protection Specialties.
   7. Division 22, for plumbing system requirements for storm shelters.
   8. Division 23, for ventilation for storm shelters.
   9. Division 26, for lighting and electrical requirements for storm shelters.
   10. Other sections
   11. Requirements noted in the Drawings and other sections related to storm shelters.

1.03 REFERENCES

A. ICC-500: ICC/NSSA Standard for the Design and Construction of Storm Shelters, most current version, or version currently in force by authorities having jurisdiction.

1.04 DEFINITIONS

A. Authority(ies) having jurisdiction: The organization, political subdivision, office, or individual charged with the responsibility for administering and enforcing the provisions of the ICC-500 design standard.

B. ICC: International Code Council.

C. NSSA: National Storm Shelter Association.

1.05 SUBMITTALS

A. Product Data and Shop Drawings: Information as required for compliance with the Storm Shelter Quality Assurance Plan for each type of material or system specified that is tested and labeled by a qualified testing agency meeting the requirements of the ICC-500 design standard. Submit as required by authorities having jurisdiction.

1. Shop Drawings: Roof cladding, wall and soffit cladding, and other cladding materials, including connection details.
2. Opening impact-protective systems, and other tested systems.

B. Quality Assurance/Control Submittals: Collect and maintain copy of information as required by the Quality Assurance Plan. Make copy available to Architect, Owner, and Authorities Having Jurisdiction, and submit reports and supporting information at time(s) as may be required by authorities having jurisdiction. Submit reports to Architect and Engineer of Record in compliance with the Storm Shelter Quality Assurance Plan.
1. Certificates and Test Reports: Manufacturer's test reports and/or certificates as applicable, demonstrating that Products provided for use on this project meet or exceed specified requirements.
2. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.
3. Manufacturer's Field Reports: For installation of opening protectives, and where indicated by Manufacturers of storm rated structures and systems to ensure compliance with requirements.
4. Reports: Submit reports in accordance with requirements indicated in the Storm Shelter Quality Assurance Plan.
    a. Copies of testing, special inspections, and observation reports performed by the RDPiRC.
    b. Field reports by the Architect or Engineer of Record noting issues with compliance with Construction Documents related to the Storm Shelter design.

C. Contractor's Statement of Responsibility: Each contractor responsible for the construction, fabrication, or installation of a main windforce-resisting system or any component listed in the Storm Shelter Quality Assurance Plan shall submit a written statement of responsibility to the authority having jurisdiction, the responsible design professional, and the Owner prior to the commencement of work on the system or component. The contractor's Statement of Responsibility shall contain:
1. Acknowledgement of awareness of the special requirements contained in the Storm Shelter Quality Assurance Plan.
2. Acknowledgement that control will be exercised to obtain compliance with the Construction Documents.
3. Procedures for exercising control within the Contractor's organization, the method and frequency of reporting and the distribution of reports.
4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

1.06 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience.
2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

B. RDPiRC Testing and Inspections: Tests and inspections, unless explicitly assigned to Owner, are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Costs for retesting and reinspection construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
2. Refer to Division 01, "Quality Requirements", Quality Control article for responsibilities related to tests and inspections.
3. Contractor shall be responsible to coordinate and schedule the RDPiRC's testing, inspections, and structural observations, in accordance with the Storm Shelter Quality Assurance Plan.

C. Regulatory Requirements: Contractor is responsible for complying with requirements of authorities having jurisdiction, including but not necessarily limited to the following:
   1. Labels: Labels required for the purpose of indicating compliance with the ICC-500 standard for impact-protective systems, as indicated by the ICC-500 or authorities having jurisdiction, shall remain undisturbed, visible and legible, until such time as approved for removal by the authority having jurisdiction.
   2. Notification: Contractor shall be responsible to notify authorities having jurisdiction of testing and other construction activities that such authority may require to be present to witness. Contractor shall confirm such requirements, if any, with authorities having jurisdiction, and shall coordinate scheduling for construction activities accordingly.

D. Pre-Installation Meetings:
   1. Convene a pre-installation meeting at least one week prior to commencing any portion of the Work requiring a Contractor's Statement of Responsibility.
   2. Require attendance of parties directly affecting this portion of the Work.
   3. Introductions / Roles and Responsibilities
   4. Review extent of work, conditions of operations, procedures and coordination with related Work.
   5. Agenda, as applicable to each portion of the Work:
      a. Tour, inspect, and discuss existing conditions.
      b. Review requirements of the Construction Documents.
      c. Review additional requirements of Authorities Having Jurisdiction (if any).
      d. Review required submittals, both completed and yet to be completed.
      e. Review Shop Drawings and structural and connection details.
      f. Contractor Quality Assurance Plan Review
         1) Review special testing, inspecting, and structural observation requirements by component
         2) Review and finalize construction schedule and verify availability of materials, personnel, equipment, and facilities needed to make progress and avoid delays.
         3) Contractor's Statement of Responsiblity
      g. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.
   6. Contractor shall coordinate construction activities with testing, inspections, and structural observations required by the RDPiRC, and by other testing and inspection entities if applicable. Provide adequate notice to testing and inspecting agencies to schedule their activities and to avoid delays.
   7. Submit Contractor's Statement of Responsibility as required in the Submittals article of this specification.

E. Mockups for Storm Shelters: Prior to wall construction erect representative concrete panel mockup of storm shelter construction to demonstrate reinforcing lap lengths, staggering of couplers, vertical bar placement, horizontal bar placement at lintels and bond beams, use of bar positioners, grouting, mortar bedding and to set quality of stands for materials, workmanship and execution.
   1. Build mockup of storm shelter as shown on storm shelter drawings.
   2. Approval of mockup does not constitute approval of deviations from Contract Documents contained in mockups unless specifically approved in writing.
   3. If approved by Architect for mockup to be constructed on building, approved mockups may become part of the completed Work if undisturbed at the time of Substantial Completion. This shall be done at the risk of the General Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Provide materials that conform to drawing and specification requirements and as necessary to comply with regulatory requirements for compliance with the Storm Shelter Quality Assurance Plan.

1. Contractor is solely responsible to confirm compliance of any substitutions of materials, components, and systems proposed by the Contractor, and to fully coordinate the integration of such substituted materials, components, and systems into the complete storm shelter construction as required for compliance with the ICC-500 design standard and requirements of authorities having jurisdiction.

2.02 SOURCE QUALITY CONTROL

A. Where source quality control measures are specified, comply with the provisions of applicable specification Sections.

PART 3 - EXECUTION

3.01 COORDINATION

A. Contractor is responsible to fully coordinate the scheduling, testing, inspections, field observations, and regulatory requirements for compliance with the Storm Shelter Quality Assurance Plan.

B. Masonry Wall Coordination: Prepare and use masonry templates prior to floor slab pours to locate reinforcing and utilities to be located in masonry walls in the proper locations per specified requirements and standards for Storm Shelter Construction. Coordinate with all trades to assure proper placement.

3.02 FIELD QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
   1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.

B. Correct deficiencies in or remove and replace system or that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.03 STORM SHELTER QUALITY ASSURANCE PLAN

A. Requirements, General: Contractor shall comply with administrative requirements detailed in Part 1 of these specifications as related to the Storm Shelter Quality Assurance Plan, and the following:
   1. Submit Contractor's Statement of Responsibility prior to beginning each portion of the work, as required in Submittals Article in Part 1 of these specifications.
   2. Quality Assurance/Control Submittals as required in Part 1 of these specifications.
   3. Reports: Submit copies of reports to Architect, applicable Engineer of Record, and authorities having jurisdiction. Distribution, types, and frequency of reports for test, inspections, and structural observations, shall comply with the following requirements:
      a. For reports generated by Owner's testing and inspecting agency, coordinate with testing agency as required to allow their compliance with requirements. Forward tests to Architect and Engineer of Record, unless other method of distribution has been approved.

B. Roof cladding, soffits, and roof framing connections:

1. Main windforce-resisting systems and wind-resisting components: As indicated in Drawings.
2. Structural Observations to be performed:
    a. Type and frequency as indicated in Drawings.

C. Wall connections to roof and floor diaphragms and framing:
1. Main windforce-resisting systems and wind-resisting components: As indicated in Drawings.
2. Structural Observations to be performed:
    a. Type and frequency as indicated in Drawings.

D. Roof and floor diaphragm systems, including connectors, drag struts and boundary elements:
1. Main windforce-resisting systems and wind-resisting components: As indicated in Drawings.
2. Structural Observations to be performed:
    a. Type and frequency as indicated in Drawings.

E. Main windforce-resisting systems, including braced frames, moment frames, and shear walls:
1. Main windforce-resisting systems and wind-resisting components: As indicated in Drawings.
2. Structural Observations to be performed:
    a. Type and frequency as indicated in Drawings.

F. Main windforce-resisting system connections to the foundation:
1. Main windforce-resisting systems and wind-resisting components: As indicated in Drawings.
2. Structural Observations to be performed:
    a. Type and frequency as indicated in Drawings.

G. Fabrication and installation of components and assemblies of shelter envelope required to meet missile impact test requirements of Chapter 3 of the ICC-500 design standard:
1. Main windforce-resisting systems and wind-resisting components: As indicated in Drawings.
2. Structural Observations to be performed:
    a. Type and frequency as indicated in Drawings.

H. Wall cladding and wall cladding connections:
1. Main windforce-resisting systems and wind-resisting components: As indicated in Drawings.
2. Structural Observations to be performed:
    a. Type and frequency as indicated in Drawings.

I. Corrosion resistance or protection of exposed metal connectors providing load path continuity:
1. Main windforce-resisting systems and wind-resisting components: As indicated in Drawings.
2. Structural Observations to be performed:
    a. Type and frequency as indicated in Drawings.

J. Critical support systems and connections and debris impact protection of the components and connections:
1. Main windforce-resisting systems and wind-resisting components: As indicated in Drawings.
2. Structural Observations to be performed:
    a. Type and frequency as indicated in Drawings.

K. Foundation design:
1. Main windforce-resisting systems and wind-resisting components: As indicated in Drawings.
2. Structural Observations to be performed:
    a. Type and frequency as indicated in Drawings.

END OF SECTION 01 81 33 - STORM SHELTER QUALITY ASSURANCE PLAN

SECTION 02-4119 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of a building or structure.
2. Demolition and removal of selected site elements.
3. Repair procedures for selective demolition operations.

B. Related Sections include the following:

1. Division 1 Section - Summary for use of the premises and phasing requirements.
2. Division 1 Section - Work Restrictions for restrictions on use of the premises due to Owner or tenant occupancy.
3. Division 1 Section - Construction Progress Documentation for preconstruction photographs taken before selective demolition.
4. Division 1 Section - Temporary Facilities and Controls for temporary construction and environmental-protection measures for selective demolition operations.
5. Division 1 Section - Cutting and Patching for cutting and patching procedures for selective demolition operations.
6. Division 22, 23 Sections for demolishing, cutting, patching, or relocating mechanical items.
7. Division 26, 27, 28 Sections for demolishing, cutting, patching, or relocating electrical items.

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.
B. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.05 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
B. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
C. Schedule of Selective Demolition Activities: Indicate the following:
    1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
    2. Interruption of utility services.
    3. Coordination for shutoff, capping, and continuation of utility services.
    4. Use of elevator and stairs.
    5. Locations of temporary partitions and means of egress.
    6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition
    1. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
E. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.
F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
G. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.
H. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.06 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Professional Engineer Qualifications: Comply with Division 1 Section - Quality Requirements.
C. Comply with all applicable federal, state and local codes and ordinances and with the requirements of insurance carriers providing coverage for this work.
D. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
E. Standards: Comply with ANSI A10.6 and NFPA 241.
F. Removal of existing resilient floor coverings, sheet vinyl flooring, and cutback asphaltic adhesives shall comply with the work practices recommended by the Resilient Floor Covering Institute's "Recommended Work Practices for the Removal of Resilient Floor Coverings" dated August, 1995. In addition, asbestos-containing flooring materials shall be removed in compliance with the same RFCI recommendations, and OSHA, EPA and any state and local standards or requirements.
G. Procure and pay for all permits or certificates required for the work involved.
H. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
    1. Inspect and discuss condition of construction to be selectively demolished.
    2. Review structural load limitations of existing structure.
    3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
    4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
    5. Review areas where existing construction is to remain and requires protection.
I. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.07 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
    1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
D. Owner assumes no responsibility for condition of areas to be selectively demolished.
    1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
    2. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
E. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
    1. Hazardous materials will be removed by Owner before start of the Work.
    2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
F. Hazardous Materials: Hazardous materials are present in building to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
    1. Hazardous material remediation is specified elsewhere in the Contract Documents.

2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

G. Storage or sale of removed items or materials on-site will not be permitted.

H. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.08 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.01 REPAIR MATERIALS

A. Use repair materials identical to existing materials.
   1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
   2. Use materials whose installed performance equals or surpasses that of existing materials.

B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

E. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

F. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

H. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

I. Survey of Existing Conditions: Record existing conditions by use of measured drawings preconstruction photographs and preconstruction videotapes.
   1. Comply with requirements specified in Division 01 Section "Photographic Documentation".

2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.02 UTILITY SERVICES

A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
   1. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.
C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated utilities when requested by Contractor.
   2. Arrange to shut off indicated utilities with utility companies.
   3. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
   4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
D. Utility Requirements: Refer to Division 21 and 28 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PROTECTION OF EXISTING FACILITIES

A. The Contractor shall take all necessary precautions to insure against damage to existing work to remain in place, to be reused, or to remain the property of the Owner, and any damage to such work shall be repaired or replaced as approved by the Architect at no additional cost to the Owner.
B. The Contractor shall carefully coordinate the work of this section with all other work and construction and maintain shoring, bracing and supports, as required.
C. The Contractor shall insure that structural elements are not over-loaded and be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this section. Cutting and removal of structural elements shall be as specifically indicated on the architectural and structural drawings. No other cutting or removal of structural elements shall be permitted without specific approval of the Architect.
D. Before and during site demolition operations, Contractor shall ascertain where existing utilities are located. Any damage that may occur to existing services shall be promptly corrected by the Contractor at no additional cost to the Owner.
E. The interior of the buildings and all materials and equipment shall be protected from the weather at all times resulting from demolition for roof penetrations.

3.04 PREPARATION

A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

B. Pest Control: Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during selective demolition operations.
C. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
    1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
    2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
    3. Protect existing site improvements, appurtenances, and landscaping to remain.
    4. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
D. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
    1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
    2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
    3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
    4. Cover and protect furniture, furnishings, and equipment that have not been removed.
    5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls".
E. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
    1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
F. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
G. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
    1. Strengthen or add new supports when required during progress of selective demolition.

3.05 POLLUTION CONTROLS

A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
    1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
    2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
    1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.06 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Demolition work shall be in stages to accommodate Owner's occupancy requirements during the construction period; coordinate demolition schedule and operations with the Owner.
      a. All demolition shall be coordinated with other trades to carry the work forward without interruptions.
   2. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   3. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   4. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   5. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
   6. Maintain adequate ventilation when using cutting torches.
   7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   10. Dispose of demolished items and materials promptly.
   11. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.
   12. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."
B. Existing Facilities: Comply with building manager's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
C. Removed and Salvaged Items: Comply with the following:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's storage area designated by Owner.
   5. Protect items from damage during transport and storage.
D. Removed and Reinstalled Items: Comply with the following:
   1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

F. Concrete: Demolish in small sections. Cut concrete to a depth of at least 3/4 inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

G. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

H. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

I. Where existing plaster is indicated to be removed at existing partitions and the substrate scheduled to be re-plastered, the existing plaster shall be carefully removed and the substrate prepared to receive new plaster.

J. Where existing ceramic tile and brick tile is indicated to be removed at existing partitions and substrate scheduled to receive a new layer of gypsum board, the tile shall be carefully removed and the substrate prepared to receive a new gypsum board.

K. Where finish flooring is indicated to be removed, the flooring, including the mastic, shall be completely removed and the substrate prepared to receive the new flooring.
   1. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
      a. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
      b. Asbestos-containing flooring materials shall be removed in compliance with the RFCI recommended work practices, and OSHA, EPA and any state and local standards or requirements.
   2. Where finish ceramic/quarry tile flooring is indicated to be removed, the flooring including the cement setting bed shall be completely removed and the concrete substrate prepared to receive a new cement setting bed for finish indicated.

L. Roofing: Remove no more existing roofing than can be covered in one day by new roofing. Refer to applicable Division 7 Section for new roofing requirements.
   1. Remove existing roof membrane, flashings, copings, and roof accessories.
   2. Remove existing roofing system down to substrate.

M. Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

N. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.07 PATCHING AND REPAIRS

A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

B. Patching: Comply with Division 1 Section "Cutting and Patching."

C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
   1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.

D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

E. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
   2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
   3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

F. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.08 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove & transport debris in a manner that prevents spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
   4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Burning: Burning of demolished materials will be permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

D. Disposal: Transport demolished materials and dispose of at designated spoil areas on Owner's property.

E. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.09 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 03-1100 – CONCRETE FORMWORK

PART 1 - GENERAL

1.01 REFERENCED DOCUMENTS

A. The Drawings, Division 01 Specifications, and General Provisions and General and Supplemental Conditions of the Contract apply to work of this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 WORK INCLUDED

A. Design, fabrication, erection, and stripping of formwork for cast-in-place concrete including shoring, reshoring, falsework, bracing, proprietary forming systems, prefabricated forms, void forms, permanent metal forms, bulkheads, keys, blockouts, sleeves, pockets, and accessories. Erection shall include installation in formwork of items furnished by other trades.

1.03 RELATED SECTIONS

A. Division 01 Section - Quality Requirements for Testing Laboratory Services.
B. Division 03 Section - Reinforcing Steel.
C. Division 03 Section - Cast in Place Concrete.
D. Division 03 Section - Architectural Concrete.
E. Division 32 Section - Portland Cement Concrete Paving.

1.04 REFERENCES

A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise:
    1. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
    2. ACI 301 - Specifications for Structural Concrete for Buildings.
    3. ACI 347R - Guide to Formwork for Concrete.
    4. ACI SP-4 - Formwork for Concrete.

1.05 QUALITY ASSURANCE

A. Construct and erect concrete formwork in accordance with ACI 117, 301 and 347R.
B. Forms, shores, reshores, falsework, bracing, and other temporary supports shall be designed by the Contractor to support all loads imposed during construction including weight of construction equipment, live loads, and lateral loads due to wind and imbalance or discontinuity of building components.
C. The Contractor shall be responsible for determining when temporary supports and bracing may be safely removed, but in no case shall the curing time before form removal be less than specified herein.

1.06 TOLERANCES

A. Construct formwork to provide completed concrete surfaces complying with the following tolerances:

1. Vertical alignment:
   a. Lines, surfaces and arises less than 100 feet in height - 1 inch.
   b. Outside corner of exposed corner columns and control joints in concrete exposed to view less than 100 feet in height - 1/2 inch.
2. Lateral alignment:
   a. Members - 1 inch.
   b. Centerline of openings 12 inches or smaller and edge location of larger openings in slabs - 1/2 inch.
   c. Sawcuts, joints, and weakened plane embedments in slabs - 3/4 inch.
3. Level alignment:
   a. Elevation of slabs-on-grade - 3/4 inch.
   b. Elevation of top surfaces of formed slabs before removal of shores - 3/4 inch.
   c. Elevation of formed surfaces before removal of shores - 3/4 inch.
   d. Lintels, sills, parapets, horizontal grooves, and other lines exposed to view - 1/2 inch.
4. Cross-sectional dimensions: Overall dimensions of beams, joists, and columns and thickness of walls and slabs.
   a. 12 inch dimension or less - plus 3/8 inch to minus 1/4 inch.
   b. Greater than 12 inch to 3 foot dimension - plus 1/2 inch to minus 3/8 inch.
   c. Greater than 3 foot dimension - plus 1 inch to minus 3/4 inch.
5. Relative alignment:
   a. Stairs:
      1) Difference in height between adjacent risers - 1/8 inch.
      2) Difference in width between adjacent treads - 1/4 inch.
      3) Maximum difference in height between risers in a flight of stairs - 3/8 inch.
      4) Maximum difference in width between treads in a flight of stairs - 3/8 inch.
   b. Vertical alignment of outside corner of exposed corner columns and control joint grooves in concrete exposed to view - 1/4 inch in 10 feet.
   c. All other conditions - 3/8 inch in 10 feet.
   d. Offsets between pieces of formwork facing material:
      1) Class A - Architecturally or prominently exposed surfaces - 1/8 inch gradual or abrupt.
      2) Class B - Surfaces to receive plaster or stucco - 1/4 inch gradual or abrupt.
      3) Class C - Exposed surfaces in generally unfinished spaces - ¼ inch abrupt, 1/2 inch gradual.
      4) Class D - Concealed surfaces - 1 inch gradual or abrupt.

1.07 SUBMITTALS

A. See Division 01 Section - Submittal Procedures for submittal procedures.

B. Submittals for Review:

1. Shop drawings for fabrication and erection of forms for concrete surfaces architecturally exposed to view. Show general construction of forms including jointing and special formed joints or reveals, location and pattern of form tie placement, inserts and anchorages, and other items which visually affect exposed concrete.

2. Samples of chamfer strips, form liners, form ties, and other items which visually affect exposed concrete.

C. Submittals for Information:

1. Submit manufacturer's product data and installation instruction for proprietary materials used in exposed concrete work including form liners, release agents, form systems, ties, and accessories.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver form materials in manufacturer's packaging with installation instructions.

B. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Forms for Unexposed Concrete:
   1. Construct formwork of plywood, lumber, metal, or other acceptable material. Lumber shall be dressed on at least two edges and one side for tight fit.

B. Formed Voids under Grade Beams: Corrugated fiberboard box forms, in size indicated on drawings and as manufactured by National Container Corporation or approved equal, and rated to sustain a load exceeding the total weight of fresh concrete placed over the voids.

C. Forms for Exposed Concrete:
   1. Construct formwork with plywood, metal, or other panel type materials designed to provide continuous straight and smooth as-cast surfaces with minimum number of joints. Joints shall be made tight and shall be backed so that edges of adjoining formwork remain flush. Joints shall be vertical or horizontal, unless noted otherwise.
   2. Wood forms shall be constructed of 3/4 inch, APA B-B Plyform, Class 1, Exterior conforming to PS-1. Panels shall be mill oiled and all edges shall be sealed.

D. Forms for Architecturally Exposed Concrete:
   1. Construct formwork with plywood, metal, or other panel type materials designed to provide continuous straight and smooth as-cast surfaces with minimum number of joints. Joints shall be made tight and shall be backed so that edges of adjoining formwork shall remain flush and true. Joints shall be vertical or horizontal, unless noted otherwise.
   2. Forms shall be constructed from one of the following:
      a. Plywood: 3/4 inch, APA High Density Overlay (HDO), Exterior conforming to PS-1. All edges shall be sealed.
      b. Plastic Faced Plywood: 3/4 inch, APA A-C, Class 1, Exterior conforming to PS-1 faced with high density polyethylene or PVC sheet. All edges shall be sealed.
      c. Steel: 3/16 inch smooth blue mill plate steel, well matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces. All joints shall be welded full and ground smooth and flush with surrounding surfaces.
      d. Glass Fiber Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surface.

E. Cylindrical Forms:
   1. Forms to be used at exposed columns, light pole bases and other exposed cylindrical concrete locations, shall be constructed from one of the following:
      a. Paper or Fiber Tubes: Standard ((Seamless)) plastic-lined units furnished full length without splices.
      b. Steel: Thickness and sufficient backing to prevent bulges and warps. Provide units to minimize joints. Seal and finish joints so joints are not visible in finished concrete. Units shall be free of bends, dents, holes, and rust.

c. Glass Fiber Reinforced Plastic Forms: Thickness and sufficient backing to prevent bulges and warps. Provide units to minimize joints. Seal and finish joints so joints are not visible in finished concrete. Units shall be free of bends, dents, and holes.

2.02 FORMWORK ACCESSORIES

A. Form Ties: Removable or snap-off metal of adjustable length; cone type; one inch break back dimension; free of defects that will leave holes larger than one inch diameter in concrete surface.

B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.

C. Rustications, Bevels and Chamfers: Steel, polyvinyl chloride, or milled and sealed wood of size and shape shown on the Drawings.

D. Protection Board: For use over void forms under structural slabs. Hard-pressed cellulose fiber board, 1/8 inch minimum thickness, or "Sure Void", as manufactured by Motzblock.

E. Sleeves and Blockouts: Formed with galvanized metal, galvanized pipe, polyvinyl chloride pipe, fiber tubes, or wood.

F. Nails, Spikes, Lag Bolts, Through Bolts, and Anchorages: Sized as required; of strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.01 FORM CONSTRUCTION

A. General: Construct forms to the sizes, shapes, lines and dimensions shown on the Drawings. Provide for openings, offsets, keyways, rustications, reglets, chamfers, blockouts, bulkheads, anchorages, inserts, and other features as required. Form all openings in concrete slabs as required for the vertical passage of ducts, pipes, conduits, etc.. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the Contractor. Adequately shore all concrete members to safely support all loads and lateral pressures outlined in "Recommended Practice for Concrete Formwork" (ACI 347) without distortion, excessive deflection or other damage.

B. Construction forms shall be provided for any and all items of concrete work required for or in connection with the satisfactory completion of the project, whether each such item is specifically shown or referred to or not.

C. Fabricate formwork for easy removal without hammering or prying against concrete surfaces. Form removal shall be accomplished as a hand operation, with due care to avoid damage to any finished concrete work or any reinforcing passing through forms being removed.

D. Kerf wood inserts as required for ease of removal.

E. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.

F. Fit forms placed for successive concrete placements for continuous surfaces, to accurate alignment, and within allowable tolerances.

G. Minimize form joints. Symmetrically align joints and make watertight to prevent leakage of mortar. Should construction joints prove to be absolutely unavoidable, locate such joints within the middle third of spans or as detailed on the drawings. Make no additional

construction joints under any circumstances without the written approval of the Architect. Provide appropriate keys in all construction joints, whether horizontal or vertical.

H. Form intersecting planes to provide true corners with edge grain of plywood not exposed as form for concrete.

I. Erect, support, brace, and maintain falsework to safely support all applied loads until such loads can be supported by the concrete structure.

J. Construct formwork to cambers shown or specified on the Drawings to allow for structural deflection of the hardened concrete. Provide additional elevation or camber in formwork as required for anticipated formwork deflections due to weight and pressures of concrete and construction loads.

K. Forms for Exposed Concrete:
   1. Drill forms from the contact face to the outside to suit form ties used. Do not splinter forms by driving ties through improperly prepared holes.
   2. Provide sharp, clean corners at intersecting planes without visible edges or offsets. Back joints with extra studs or girts if required to maintain corners.
   3. Provide extra studs, girts, walers, and bracing to prevent bowing of forms.
   4. Form shapes, recesses and projections with smooth finish materials, and install in forms with sealed joints.
   5. Locate form ties in level horizontal rows, plumbed vertically, and in symmetrical arrangements, unless noted otherwise.
   6. Special care shall be given to formwork, ties, bracing, etc. for any concrete surface to be left exposed to permanent view. Waves, bulges, form marks, staining, joint marks or irregularities shall be considered unacceptable.

L. Corner Treatment: Form exposed corners of beams, walls and columns with chamfered edges, unless noted or shown otherwise.
   1. Form chamfers with 3/4 inch by 3/4 inch strips, unless noted otherwise.
   2. Unexposed corners may be formed square or chamfered.

M. Foundation Elements: The sides of all below grade portions of beams, pier caps, walls, and columns shall be formed straight and to the lines and grades specified.

3.02 APPLICATION OF FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

B. Do not apply form release agent where concrete surfaces are scheduled to receive subsequent finishes which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

3.03 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for work embedded in or passing through concrete. In case of conflict with reinforcing steel or structural embeds, consult Architect before placement.

B. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.04 FORM REMOVAL

A. Formwork not supporting concrete, such as side forms for beams, walls, and columns, may be removed after cumulatively curing at not less than 50 degrees Fahrenheit (10 degrees Celsius) for 12 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal, and provided curing and protection operations are maintained.

B. Formwork supporting conventionally reinforced concrete shall not be removed until concrete has attained 85 percent of its specified 28 day compressive strength as established by tests of field cured cylinders. In the absence of cylinder tests, supporting formwork shall remain in place until the concrete has cured at a temperature of at least 50 degrees Fahrenheit (10 degrees Celsius) for the minimum cumulative time periods given in ACI 347, Section 3.7.2.3. When the surrounding air temperature is below 50 degrees Fahrenheit (10 degrees Celsius), that time period shall be added to the minimum listed time period. Formwork for two-way conventionally reinforced slabs shall remain in place for at least the minimum cumulative time periods specified for one-way slabs of the same maximum span.
C. Minimum cumulative curing times may be reduced by the use of high-early strength cement or forming systems which allow form removal without disturbing shores, but only after the Contractor has demonstrated to the satisfaction of the Architect that the early removal of forms will not cause excessive sag, distortion or damage to the concrete elements.
D. Wood forms shall be completely removed. Provide temporary openings if required.
E. Provide adequate methods of curing and thermal protection of exposed concrete if forms are removed prior to completion of specified curing time.
F. Areas required to support construction loads in excess of 20 psf shall be reshored to properly distribute construction loading. Construction loads up to the rated live load capacity may be placed on unshored construction provided the concrete has attained the specified 28 day compressive strength.
G. Obtaining concrete compressive strength tests for the purposes of form removal shall be the responsibility of the Contractor.

3.05 SHORES AND RESHORES FOR MULTILEVEL STRUCTURES

A. Comply with ACI 347 and these specifications regarding shoring and reshoring.
B. The Contractor shall be solely responsible for proper shoring and reshoring.
C. Extend shores or reshores from ground to top level in structure three stories or less in height, unless noted otherwise.
D. In crawl spaces or basements, shores or reshores shall extend to mud pads seated firmly on the soil or to on-grade construction.
E. All levels of reshores may be removed after formwork for the uppermost floor has been removed in accordance with these specifications.

3.06 REUSE OF FORMS

A. Clean and repair surfaces of forms to be reused. Damaged forming material shall not be replaced and shall not be used in construction.
B. Apply form release agent to concrete contact surfaces prior to each reuse of the forms.

3.07 CLEANING

A. Upon completion of work of this section, remove related debris from job site.

END OF SECTION 03 11 00

SECTION 03-2000 – CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Includes furnishing all materials, equipment, transportation and facilities and performing all labor necessary for the following:
   1. Prepare shop drawings of reinforcing steel.
   2. Furnish and place reinforcing steel.
   3. Fabrication and installation of embedded metal assemblies.
B. Related Sections include the following:
   1. Division 01 Section - Quality Requirements.
   2. Division 03 Section - Concrete Formwork.
   3. Division 03 Section - Cast-in-Place Concrete.
   4. Division 03 Section - Tilt-Up Concrete.
   5. Division 31 Section -"Drilled Piers.

1.03 SUBMITTALS

A. Division 01 Section - Submittal Procedures: Procedures for submittals.

B. Shop Drawings: Submit shop and installation drawings of reinforcement and embedded metal assemblies for review by the Engineer. Reproduce the bar bending diagram, the beam, slab and joist notes and cast-in-place concrete notes that concern the proper placing of reinforcing and submit it with each set of shop drawings for field use. Use same bar marks on bar bending diagrams as used on the beam, and slab schedule. Use same beam, and wall marks as Contract Documents.

C. Mill Test Reports: Deliver certified copies, evidencing compliance with all requirements of these specifications to the Engineer with all deliveries of reinforcing steel.

D. Submit copies of laboratory inspection reports as follows:

   1. Steel Supplier - 1 Copy

   2. General Contractor - 1 Copy

   3. Owner - 1 Copy

   4. Architect - 1 Copy

   5. Structural Engineer - 1 Copy

1.04 LABORATORY TESTING AND INSPECTION

A. Shear Studs: Test shear studs welded to steel assemblies at the beginning of each period of production. A minimum of two studs shall be struck with a hammer and bent 15 degrees without fracturing the weld joint. Studs failing the test shall be replaced. Continue to test studs and adjust power and/or welding technique until two consecutive studs pass the test.

B. Inspect welding of deformed bar anchors at the beginning of each period of production for size, length and quality. Re-inspect corrected welds.

C. Reinforcing: inspect all reinforcing steel prior to placement of concrete for compliance with the Contract Documents and the approved shop drawings. All instances of noncompliance shall be immediately brought to the attention of the Contractor. If uncorrected by the contractor, they shall be listed in the report.

1. Observe and report the following: number and size of bars; bending; splicing; clearance to forms; clearance between bars; rust, form oil or other contamination; fabrication and installation of embedded metal assemblies, including visual inspection of all welds.

D. Inspector shall have a minimum of three years experience inspecting reinforcing steel in projects of similar size.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing: All of domestic manufacturers.
   1. Bars: New deformed billet steel, ASTM A-615, grade 60.
   2. Reinforcing bars to be welded: ASTM A706; Bars shall have a carbon content not exceeding 0.30% and a manganese content not exceeding 0.60%. Provide certified copies of the ladle analysis for each lot of bars to be welded.
   3. Welded Wire Fabric: "Specification for Steel Welded Wire Fabric" (ASTM A185) with yield strength Fy=60,000 psi.
   4. Epoxy coated reinforcing bars: ASTM A775.
B. Fiber reinforcing: Collated, fibrillated polypropylene fiber shall be Fibermesh.
C. Concrete accessories including bar supports, chairs, spacers, etc.: Cold-drawn wire and fabricated in accordance with the requirements of Chapter Seven of the ACI Standard 315 with heights as required.
D. Bar supports for concrete resting on earth: Precast concrete briquettes having tie wires embedded therein, or individual high chairs No. HCP with welded plates on bottom as manufactured by Hohmann & Barnard, Inc. Provide bar supports, hot-dipped galvanized after fabrication, where concrete will be exposed including ceilings of flat slabs.
E. Bar supports for reinforcing placed over carton forms to be of type to prevent puncturing the carton form.

2.02 METAL ANCHORAGE & CONFINEMENT ASSEMBLIES

A. Steel Shapes and Plates and Rods: Conform to ASTM A572 Grade 50 for shapes, ASTM A26 for bars, plates, angles and miscellaneous steel.
B. Welded Deformed Bar Anchors: welded by full-fusion process; "Nelson" Anchors Type D2L or approved equal.
C. Headed Stud Anchors: Headed Studs welded by full fusion process as furnished by Nelson Stud Welding Company or approved equal.

D. Bolts: Conform to ASTM A307 with regular hexagon nuts and carbon steel washers.
E. Straps: Conform to ASTM A245 or A284.
F. Welding Electrodes: ASTM Designation A233, Series E70 - AWS 5.5.

2.03 FABRICATION

A. Fabricate reinforcing steel in compliance with the CRSI "Manual of Standard Practice".
B. All bar splices shall be a minimum of Class "A" lap specified otherwise on drawings.
C. Shop-fabricate reinforcing bars to conform to the required shapes and dimensions, with fabrication tolerances complying with ACI 315. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken the material.
D. Deliver all reinforcement to the project site bundled, tagged and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.
E. Reinforcing with any of the following defects will not be permitted in the work: Bar lengths, depths, and bends exceeding the specified fabrication tolerances, bends or kinks not indicated on drawings or final shop drawings, bars with reduced cross-section due to excessive rusting or other cause.

2.04 COATING

A. Rust inhibitor for field application to metal accessories shall be Hi-Build Epoxoline manufactured by the TNEMEC Co., Kansas City, Missouri or approved equal.
B. Hot dip galvanizing shall conform to ASTM A123.
C. Cold Galvanizing Compound for field repair of galvanizing shall be "ZRC Cold Galvanizing Compound" by ZRC Chemical Products Company, Quincy, Massachusetts, or approved equal.

PART 3 - EXECUTION

3.01 MATERIAL STORAGE

A. Stack reinforcing steel in tiers. Exercise care to maintain all reinforcement free of dirt, mud, paint, rust, etc.

3.02 GENERAL

A. Place reinforcing steel of the sizes, shapes, lengths, spacing and other dimensions where shown on the drawings. Details of reinforcing shall conform to the ACI Building Code Requirements for Structural Concrete (ACI 318-99).

3.03 MARKING

A. Mark bars plainly. Limit bundles to 1 size and 1 length and tag each bundle with metal tags.

3.04 CLEANING

A. Clean reinforcement thoroughly of rust, mill scale, dirt, oil or other coatings which might tend to reduce the bonding to the concrete.

3.05 BENDING

A. Bend bars cold. Heating of reinforcement, or handling by makeshift methods, will not be permitted and bars having kinks or bends not required will be rejected.

3.06 PLACING

A. Comply with the specified codes and standards, and the Concrete Reinforcing Steel Institute recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
B. Place reinforcement accurately, securely saddle tie at every other intersection with No. 18 gauge black annealed wire, and rigidly hold in place during the placing of the concrete by means of metal chairs or spacers.
C. Hold bars in position and to proper clearance of concrete surface by spacers, chairs, or other necessary supports with the following tolerances:
    1. Top bars in slabs and beams:
        a. Members 8" deep or less: ± 3/8"
        b. Members more than 8" but not over 2' deep: ± 1/2"
        c. Members more than 2': ± 3/4"
    2. Lengthwise of members: ± 2"
    3. Concrete cover to formed surfaces: ± 1/4"
    4. Minimum spacing between bars: ± 1/4"

3.07 CONCRETE PROTECTION

A. Minimum protection for reinforcing steel shall be as follows:
    1. Grade beams and exterior face of walls and columns exposed to the weather or in contact with the ground: 2".
    2. Reinforcing in structural elements deposited against soil: 3" Interior faces of walls: 1".
    3. Beam and slab bottoms formed with fiberboard void boxes: 2"
    4. Slabs: 3/4".

3.08 EMBEDDED METAL ASSEMBLIES

A. Fabricate and assemble structural steel items in the shop. Shearing, flame cutting, and chipping shall be done carefully and accurately. Holes shall be cut, drilled, or punched at right angles to the surface of the metal and shall not be made or enlarged by burning. Welded construction shall conform to the AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings and AWS D1.1. Welding shall be done by AWS certified welders.
B. Welding of deformed bar anchors and headed stud anchors shall be done by full-fusion process equal to that of Nelson Stud Welding Company.
C. Metal assemblies located in the crawlspace shall be hot dip galvanized. Repair galvanizing after welding with specified Cold Galvanizing Compound.

END OF SECTION 03 20 00

SECTION 03-3000 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.
B. Floors and slabs on grade.
C. Concrete reinforcement.
D. Joint devices associated with concrete work.
E. Miscellaneous concrete elements, including equipment pads, light pole bases, and manholes.
F. Concrete curing.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Mix Design: Submit proposed concrete mix design.
    1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
    2. For each concrete mixture, include the following:
        a. Mixture identification.
        b. Minimum 28-day compressive strength.
        c. Durability exposure class.
        d. Maximum w/cm.
        e. Slump limit.
        f. Air content.
        g. Nominal maximum aggregate size.
        h. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
        i. Intended placement method.
        j. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
C. Samples: Submit samples of underslab vapor retarder to be used.
D. Test Reports: Submit report for each test or series of tests specified.
E. Sustainable Design Submittal: Submit environmental assessment report for concrete mix. Compare concrete mix submitted with a conventional or reference concrete mixture that meets the specified performance requirements. Include:
    1. Energy consumption.
    2. Emissions.
    3. Potential toxicity.
    4. Potential risk.
    5. Raw material consumption.
    6. Land use.
    7. Third-party validation of comparison methodology.

1.03 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
B. Follow recommendations of ACI 306R when concreting during cold weather.

1.04 WARRANTY

A. See Section 01-7800 - CLOSEOUT SUBMITTALS for additional warranty requirements.

B. FIELD CONDITIONS

C. Cold-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 306.1 and as follows.
   1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   2. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).

D. Do not use frozen materials or materials containing ice or snow.
   1. Do not place concrete in contact with surfaces less than 35 deg F (1.7 deg C), other than reinforcing steel.
   2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

E. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:
   1. Maintain concrete temperature at time of discharge to not exceed 95 deg F (35 deg C).
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 PRODUCTS

2.01 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Finish: Unfinished, unless otherwise indicated.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
   1. Form: Flat Sheets.

C. Reinforcement Accessories:
   1. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.02 CONCRETE MATERIALS

A. Blended, Hydraulic Cement: ASTM C595, Type IL - Portland-Limestone Cement.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

C. Fly Ash: ASTM C618, Class C or F.

D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.03 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

E. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

F. Accelerating Admixture: ASTM C494/C494M Type C.

G. Retarding Admixture: ASTM C494/C494M Type B.

H. Water Reducing Admixture: ASTM C494/C494M Type A.

2.04 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
   1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
   2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Grout: Comply with ASTM C1107/C1107M.
   2. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
   3. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

2.05 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:
   1. Complying with ASTM C881/C881M and of Type required for specific application.

C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
   1. Material: ASTM D1751, cellulose fiber.

2.06 CURING MATERIALS

A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309, Type I, Class B.

B. Moisture-Retaining Sheet: ASTM C171.

C. Water: Potable, not detrimental to concrete.

2.07 CONCRETE MIX DESIGN

A. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

C. Class A: Normal-weight concrete used for foundation and grade beams:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3,000 pounds per square inch.

D. Class C: Normal-weight concrete used for interior slabs-on-ground.
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
   2. Water-Cement Ratio: Maximum 45 percent by weight.
   3. Maximum dry unit weight: 470 pounds per cubic foot.
   4. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
   5. Air Content:
      a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.

E. Class H: Normal-weight concrete used for exterior retaining walls.
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4500 pounds per square inch.
      a. Water-Cement Ratio: Maximum 45 percent by weight.
      b. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm) or 8 inches (200 mm), plus or minus 1 inch (25 mm) for concrete with verified slump of 3 inches (75 mm), plus or minus 1 inch (25 mm) before adding high-range water-reducing admixture or plasticizing admixture at Project site.
      c. Air Content:
         1) 5.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-1/2-inch (38-mm) nominal maximum aggregate size

2.08 MIXING

A. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.

B. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

3.05 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 1/8 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
   1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15, on-grade only.
   2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.
   3. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
   4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.
   5. Parking Surfaces: F(F) of 20; F(L) of 15, on-grade only.
B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.
C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.
D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

A. As-cast Surface Finish:
   1. ACI 301 (ACI 301M) Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
      a. Patch voids larger than 1-1/2 inches (38 mm) wide or 1/2 inch (13 mm) deep.
      b. Remove projections larger than 1 inch (25 mm).
      c. Tie holes do not require patching.
      d. Surface Tolerance: ACI 117 (ACI 117M) Class D.
      e. Apply to concrete surfaces not exposed to public view
B. Exposed Form Finish:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
C. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   2. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

3.08 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
D. Surfaces Not in Contact with Forms:

1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
2. Final Curing: Begin after initial curing but before surface is dry.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01-4000 - QUALITY REQUIREMENTS.
B. Provide free access to concrete operations at project site and cooperate with appointed firm.
C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

3.11 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 03-3500 – CONCRETE FINISHES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Concrete finishes.
   2. Curing products.
   3. Concrete sealers and hardeners.
B. Related Sections include the following:
   1. Division 03 Section - Cast-in-Place Concrete.
   2. Division 3 Section "Polished Concrete Floor Finishing".
   3. Division 3 Section "Self - Leveling Concrete Topping".
   4. Division 5 Section "Expansion Joint Assemblies".
   5. Division 7 Section "Joint Sealants".

1.03 REFERENCES

A. The latest adopted edition of all standards referenced in this section shall apply, unless noted otherwise.
   1. ACI 301 - Specifications for Structural Concrete for Buildings
   2. ACI 302 - Guide for Concrete Floor and Slab Construction
   3. ACI 117-10 - Specification for Tolerances for Concrete Construction and Materials
   4. ASTM E1155 - Determining Floor Flatness and Levelness Using the F-Number System (Inch-Pound Units).

1.04 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
B. Product Data: Submit manufacturer's data showing compliance with the specifications.
C. Mockups: Build concrete mockups to demonstrate typical joints, surface finish, texture, and standard of workmanship.
   1. Build finish mockups approximately as 8'x8'x4" temporary slabs for Owner's review and approval of apparatus bay finish texture.
   2. If Architect determines that mockups do not meet requirements, demolish and remove them from the site and cast others until mockups are approved.
   3. Refer to Division 03 Section "Polished Concrete Floor Finishing" for polished slab mockups.
D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
   1. The Contractor shall call a meeting to review the detailed requirements for floor construction, including the concrete placing techniques, finishing techniques, curing

techniques, and the application of floor finishing materials. All contractors involved in the floor installation shall attend the conference.

2. Contractor shall verify that the planned concrete finish measurements and tolerances are acceptable for the flooring material and product specifications.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.06 PROTECTION

A. Protect exposed concrete finishes from damage and soiling by other trades. Mask surfaces with polyethylene film as required. Cover exposed concrete floors to receive sealed finish to protect against spillage of grease, paint, pitch, and other harmful substances. Alternate protection methods may be used if approved by Architect in writing.

PART 2 - PRODUCTS

2.01 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

1. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
2. Moisture-Retaining Cover: Waterproof paper, for curing exposed finish concrete floors, shall be non-staining, reinforced with fibers, and conforming to the requirements of the current edition of ASTM C171-03. A product that meets these requirements is "UltraCure NCF" as manufactured by McTech Group, Inc., Loganville, GA (866) 913-8363.
3. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 25 percent solids content, minimum.
4. Water: Potable.

2.02 FLOOR AND SLAB SEALANT TREATMENTS

A. Concrete Sealers, Hardeners and Coatings: Coordinate requirements of hardener/densifier products with concrete mix designs and chemical admixtures and curing methods. These products are chemically reactive with the free lime in concrete and performance and appearance will be adversely affected by chemicals that react with lime or that impede the ability of the hardener/densifier to react. Do not use chemical admixtures or curing compounds unless specifically approved in writing.

1. Exposed concrete floor slabs with light broom finish: Two- or Multiple-Coat, spray-applied, hardener/densifier. Chemical reactive magnesium fluorosilicate formulation with chemical resistant properties to alkali, acids, oils and salts, and does not substantially change appearance of concrete surfaces. Provide one of the following or approved equal product by another Manufacturer:
   a. MasterKure HD 300 WB by BASF.
   b. "Surf-Hard" by Euclid Chemical Co.
2. Exposed concrete floor slabs with smooth troweled finish: One coat flood-applied, hardener/densifier. Chemical reactive silicate / siliconate formulation that enhances sheen level of troweled concrete and is designed to maintain or increase sheen level over

time with normal wear. Provide one of the following or other comparable product by another Manufacturer:
a. Dayton Superior; "Sure-Hard Densifier J17", www.daytonchemical.com.
b. CureCrete Chemical Company; "Ashford Formula", www.ashfordformula.com.
c. Euclid Chemical Company; "Euco Diamond Hard", www.euclidchemical.com.

2.03 RELATED MATERIALS

A. Semi-rigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A Shore durometer hardness of 80 per ASTM D 2240.
B. Sawcut joint filler: Euco 700 epoxy by The Euclid Chemical Company, or approved equal.
C. Refer to Division 03 Section "Cast in Place Concrete", for patching materials and other materials related to non-polished concrete.
D. Refer to Division 03 Section "Polished Concrete Floor Finishing" for materials related to polished floors.
E. Sealants: Refer to Division 07 "Joint Sealants".
F. Floor Leveling Compound: Where required for existing rough and uneven floors as an underlayment for tile or other floor finishes. Hydraulic Cement Underlayment, provide Latex base liquid emulsion with Portland Cement and sand, as made by Camp's, MAPIE, Henry or Sonocrete.

PART 3 - EXECUTION

3.01 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
1. Concrete slabs shall be finished as specified below, within the tolerances specified elsewhere in this Section.
2. Coordinate concrete placement and finishing with the requirements of section 03 30 00 Cast-In-Place Concrete and section 03 35 36 Polished Concrete Floor Finishing. The most restrictive requirement shall govern and be followed.
3. Highway straightedges are recommended for use in lieu of bullfloats for all slab placement and finishing operations.
4. Screeding: Immediately after placing, slab shall be vibrated and struck off true by double screeding to the required level, at or below the elevation or grade of the finished slabs as indicated on the Drawings.
5. Vibrators shall not be used to spread the concrete. When camber is indicated for slabs supported on formwork, screed to the required camber. Fixed screed guides are recommended where specified surface tolerance exceeds FF25/FL20.
6. Takes care when using vibrators at polished floor slabs to ensure vibrator is not in contact with reinforcing which could cause "ghosting" of the reinforcing in the polished slab finishes. Coordinate requirements with the polished floor finish applicator.
7. Floating: Immediately after screeding, before any excess bleed water is present on the surface, float the surface using long-handled bull floats or darbies.
8. Straightedging: Immediately after screeding and before excess bleed water is present on the surface, straighten the surface using a highway straightedge.
9. Edging and jointing, where required, shall be done after bleed water has evaporated and before further finishing.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
2. Locations: All concrete surfaces under waterproofing membrane, setting beds for brick, mud-set tile, pavers, or terrazzo, and noncomposite topping slabs.

C. Preparation: As soon as forms are removed, remove undesired fins and other projections, level offsets, and saturate voids or damaged places immediately with water and repair with mortar of same composition as used in mix. Apply applicable finish as specified below, where scheduled and shown on Drawings.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Locations: Exposed concrete floors not otherwise specified, concrete surfaces under carpets, vinyl tile, thin set tile, wood flooring, elastomeric coatings, and painted concrete floors.

E. Trowel and Fine-Broom or Horsehair Finishes: Apply a first trowel finish to surfaces where ceramic tile is to be installed by either thickset or medium / thin-set methods. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
2. Apply Horsehair or fine broom finish to apparatus bay floor, as approved by mockup review.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.02 FINISHING EXPOSED CONCRETE SURFACES

A. General: Provide aesthetically pleasing concrete finish as judged by Architect for the following applications, and as herein specified:
1. Concrete plinth bollards, light or flag pole bases and similar conditions.
2. Exposed interior concrete grade beams or elevation changes, mezzanine slab edges and similar conditions.
3. Areas of exposed exterior grade beams or slab dges at building perimeter and/or dumpster enclosure.

B. Preparations: As soon as forms are removed, remove undesired fins and other projections, level offsets, and saturate voids or damaged places immediately with water and repair with mortar of same composition as used in mix. Apply applicable finish as specified below, where scheduled and shown on Drawings.

C. Concrete Plinth (Bollards): Plinths shall be finished to match lines and levels of other plinths, and shall be constructed with smooth, straight lines and consistent dimension chamfers throughout the work.
1. Variation in dimension of chamfers: 1/8" maximum.
2. Other variations in dimensions and straightness of lines should not be noticeable when viewed with the unaided eye from a distance of 10 feet.
3. Differences in finish between different plinths, or within a single plinth not noticeable when viewed from 10 feet away.

D. Smooth Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform texture. Do not apply cement grout other than that created by the rubbing process. Continue

surface treatment of adjacent similar formed surfaces until finish is uniform, unless otherwise indicated.

1. Exposed surfaces of concrete grade beams.
2. Concrete plinths.
3. Turn-down (retaining) edges of paving.

E. Parged Finish: Provide at vertical surfaces exposed to view in completed work as specified herein and any other locations as indicated in Drawings.
   1. After removal of forms, patching, and repairing, and while concrete is still green, spread slurry consisting of 1 part Portland cement and 1-1/2 part damp, loose sand by volume, over pre-dampened surface. Apply using burlap pads or sponge rubber floats. Remove surplus material, and then rub with clean burlap. Finished rubbed surface shall be uniformly smooth, entirely free of pits, holes, or form marks and similar in texture to sand finished limestone. Large surface swirls or heavily textured surfaces are not acceptable. Finish shall match approved samples.
   2. Locations: Interior mezzanine slab edges, and light pole bases. Protect masonry below, floor, and other adjacent finishes, from soiling when parging interior concrete.

F. Wall Panel Finish: Apply medium sandblast to all exterior exposed surfaces of concrete wall panels; interior surfaces of panels to receive steel trowel finish and paint.

G. Paint the following surfaces in color(s) as selected by architect to match or complement adjacent surfaces:
   1. Concrete plinths.
   2. Light pole bases.
   3. Interior exposed concrete mezzanine slab edges and similar exposed interior concrete surfaces.
   4. Exposed grade beams, if directed by Architect.

3.03 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than 14 days' old. Do not apply in areas adjacent to those scheduled to received polished concrete floor finish until there are solid walls and protection in place between these areas or until after polished concrete floor finishing is complete. Protect finished polished floors from contamination by the application of this product, inadvertent or otherwise.
   3. Apply spray application product (apparatus bay / light textured spaces) in two or more coats, in accordance with Manufacturer's application instructions.
   4. Apply flood application product (smooth troweled finished floor surfaces) until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner in accordance with Manufacturer's installation instructions if surface is still rough or porous.

3.04 SUBFLOOR MAINTENANCE AND PREPARATION

A. Prior to installation of finish floor coverings, remove dirt, oil, grease, paint and other foreign matter from surfaces. Inspect for holes, cracks and other abrasions and fill such defects with latex floor leveling compound. Disc-sand high spots and abrasions.

3.05 CONTROL JOINTS

A. Saw-cut Control Joints: Form weakened-plane control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into concrete slab when cutting action will not tear, abrade, or otherwise damage surface and before random contraction cracks develop.
B. Construct control joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness, unless otherwise indicated.

3.06 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
B. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
C. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
D. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.
    1. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.07 CONCRETE FINISH MEASUREMENT AND TOLERANCES

A. Two-Tiered Measurement Standard: Each floor test section and the overall floor area shall conform to the two-tiered measurement standard as specified herein.
    1. Minimum Local Value: The minimum local FF/FL values represent the absolute minimum surface profile that will be acceptable for any one test sample (line of measurements) anywhere within the test area.
    2. Specified Overall Value: The specified overall FF/FL values represent the minimum values acceptable for individual floor sections as well as the floor as a whole.
B. Floor Test Sections:
    1. A floor test section is defined as the smaller of the following areas:
        a. The area bounded by column and/or wall lines.
        b. The area bounded by construction and/or control joint lines.
        c. Any combination of column lines and/or control joint lines.
    2. Test sample measurement lines within each test section shall be multidirectional along two orthogonal lines, as defined by ASTM E1155, at a spacing to be determined by the Owner's testing agency.
    3. The precise layout of each test section shall be determined by the Owner's testing agency.
C. Concrete Floor Finish Tolerances:
    1. The following values apply before removal of shores. Levelness values (FL) do not apply to intentionally sloped or cambered areas, nor to slabs poured on metal deck or precast concrete.
        a. Suspended/Structured Slabs:
            1) Floors to be covered with carpet or vinyl tile, unless otherwise specified:
                a) Overall Value FF25/FL20
                b) Minimum Local Value FF17/FL15
            2) Interior vehicle exposed concrete floors:
                a) Overall Value FF20/FL15
                b) Minimum Local Value FF15/FL10
            3) Floors to be covered with thin-set tile:
                a) Overall Value FF35/FL20
                b) Minimum Local Value FF24/FL15
            4) Mechanical rooms, recessed floors, and mezzanine slabs:

a) Overall Value FF20/FL15
b) Minimum Local Value FF15/FL10

5) Exposed polished concrete floors: Refer to Division 03, Section "Polished Concrete Floor Finishing".

D. Floor Elevation Tolerance Envelope:
1. The acceptable tolerance envelope for absolute elevation of any point on the slab surface, with respect to the elevation shown on the Drawings, is as follows:
2. Slab-on-Grade Construction: +/- 3/4"- Typ. U.N.O.
3. Top surfaces of formed slabs measured prior to removal of supporting shores: +/- 3/4"
4. Top surfaces of all other slabs: +/- 3/4"
5. Slabs specified to slope shall have a tolerance from the specified slope of 3/8" in 10'- 0" at any point, up to 3/4" from theoretical elevation at any point.

3.08 FIELD QUALITY CONTROL

A. Concrete Floor Flatness and Levelness:
1. Measurement Standard: Floors shall be measured for flatness and levelness according to ASTM E1155, "Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System." Tolerances are specified in Section 03 30 00.
2. Time Period for Measuring and Reporting: All measurements shall be made by the testing laboratory or designated agency before the end of the next workday after the completion of finishing operations. For structural elevated floors, measurement shall also be made prior to removal of forms and shores. The Contractor shall be notified immediately after the measurements of any section are complete, and a written report of the floor measurement results shall be submitted within 72 hours after finishing operations are complete. The Contractor shall take immediate action to correct any work that is outside the specified tolerances.
3. Measuring Equipment: The concrete surface profile shall be measured using equipment manufactured for the purpose, such as the Dipstick Floor Profiler, as manufactured by the Edward W. Face Company, Norfolk, Virginia, or by other methods specified in ASTM E1155.
4. Floor Test Sections:
a. A floor test section is defined as the smaller of the following areas:
b. The area bounded by column and/or wall lines.
c. The area bounded by construction and/or control joint lines.
d. Any combination of column lines and/or control joint lines.
1) Test sample measurement lines within each test section shall be multidirectional along two orthogonal lines.
e. The precise layout of each test section shall be determined by the testing agency and shall be submitted for the Architect's review and approval.

3.09 REPAIRS

A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.
B. Remedial Measures for Slab Finish Construction not Meeting Specified Tolerances:
1. Application of Remedial Measures. Remedial measures specified herein are required whenever either or both of the following occur:
a. The composite overall values of flatness or levelness of any test section or the entire floor installation measure less than specified values.
b. Any individual test sample (line of measurements) measures less than the specified absolute minimum flatness or levelness value.
2. Modification of Existing Surface:

a. If, in the opinion of the Architect or Owner's representative, all or any portion of the substandard work can be repaired without sacrifice to the appearance or serviceability of the area, the Contractor shall immediately undertake the approved repair method.
b. The Contractor shall submit for review and approval a detailed work plan of the proposed repair showing areas to be repaired, method of repair, and time required to make the repair.
c. Repair method(s), at the sole discretion of the Architect or Owner's Representative, may include grinding (floor stoning), planing, re-topping with specified floor leveling compound, or any combination of the above.
d. All repair work shall be performed at no additional cost to the Owner and with no extension to the construction schedule.

3. Removal and Replacement:
   a. If, in the opinion of the Architect/Engineer or Owner's Representative, all or any portion of the substandard work cannot be satisfactorily repaired without sacrifice to the appearance or serviceability of the area, the Contractor shall remove and replace the defective work as directed.
   b. Replacement sections may be retested for compliance at the discretion of the Architect/Engineer or Owner's Representative.

C. All replacement work shall be performed at no additional cost to the Owner and with no extension to the construction schedule.

3.10 CLEANING

A. Clean surfaces as required with soap and water until foreign matter and dirt are removed.

END OF SECTION 03 35 00

SECTION 03-3536 – POLISHED CONCRETE FLOOR FINISHING

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes: Products and procedures for placement, finishing, and polishing cast-in-place concrete floors, to be installed by a Manufacturer Certified Applicator.
1. Interior dyed polished concrete floors.
2. Decorative saw cut and routered patterns.
3. Joint sealants for polished concrete floors.
4. Requirements for placing and curing polished concrete floor slabs.

B. Related Sections include the following:
1. Division 03, Section "Cast-in-Place Concrete", and other Sections related to floor slab placement and finishing.
2. Division 03, Section "Concrete Floor Finishing" for application of hardener/densifier at unpolished sealed concrete floors in mechanical and similar spaces.

1.03 REFERENCES

A. ASTM C 779 - Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.

B. ASTM C 1028 - Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method; 1996.

C. ASTM G23-96 - Standard Practice for Operating Light - Exposure Apparatus (Carbon-Arc Type) with and without Water Exposure of Nonmetallic Materials.

D. ASTM C805 - Standard Test Method for Rebound Number of Hardened Concrete.

1.04 SUBMITTALS

A. Product Data: Manufacturer’s technical literature for each product indicated, specified, or required. Include manufacturer's technical data, application instructions, and recommendations.

B. Samples for Initial Selections:
1. Manufacturer's color card for concrete dyes.
   Aggregates: Labeled, sealed plastic bags with one pound of each aggregate in concrete mix.

C. Samples for Verification: Submit 12 inch square samples of polished finish in each color, texture, and pattern specified include not less than 3 in each sample set showing limits of variations expected for each color, texture, and pattern specified. Resubmit samples until approved.

D. Informational Submittals:
1. Manufacturer's Certification.
   a. ANSI/NFSI, Ph. 2" "High Traction" Certified
2. Applicator's Qualifications.
3. Field Quality Control Reports:
   a. Submit Manufacturer's field quality control reports / recommendations for field visits as described by Field Quality Control article.
   b. Certification of coefficient of friction as required by Field Quality Control article.

E. Closeout Submittals: Maintenance Data: For inclusion in operation and maintenance manual required by Division 01. Include manufacturer’s instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under

anticipated use. Include precautions against cleaning products and methods which may be detrimental to polished finishes and performance.

1.05 QUALITY ASSURANCE

A. Manufacturer's Quality Assurance: Submit manufacturer’s certification that products comply with specified requirements and are suitable for intended application.

B. Applicator's Qualifications:
   1. Supervision: Maintain competent supervisor who is at Project during times specified Work is in progress, and, who is experienced in installing systems similar to type and scope required for Project.
   2. Manufacturer's Certification: Provide letter of certification from sealer/hardener manufacturer stating that the applicator is a certified applicator of the Manufacturer's polishing system and is familiar with proper procedures and installation requirements required by the manufacturer for diamond polishing.
   3. Experience: Company with not less than 5 years continuous experience under the current name in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce required Work.
   4. Upon request, submit list of a minimum of 5 completed projects of comparable or greater size and complexity to this Work. Include for each project:
      a. Project name and location.
      b. Name and contact information for Owner.
      c. Name and contact information of General Contractor (if applicable).
      d. Name and contact information of Architect.
      e. Name of Polished Concrete Floor Finish manufacturer.
      f. Approximate square footage of densified diamond polishing system installed.
      g. Date of completion.

C. Concrete Producer Qualifications: Firm experienced in manufacturing ready-mixed concrete products and that complies with following requirements for production facilities and equipment:
   1. ASTM C 94.
   2. NRMCA's Certification of Ready Mixed Concrete Production Facilities.

D. Static Coefficient of Friction: Products and polishing operations shall achieve following as determined by quality control testing according to NFSI 101-A:
   1. Level Floor Surfaces, typical: Minimum 0.6, dry.
   2. Level Floor Surfaces in Restrooms, Kitchens, Locker Rooms, and other Wet Areas: Minimum 0.6, wet.
   3. Sloping Floor Surfaces: Minimum 0.8, dry.

E. Field Mock-up for Aesthetic Purposes: Before performing work of this Section, provide as many field samples as required to verify selections made under submittals and to demonstrate aesthetic effects of polished finish. Approval does not constitute approval of deviations from Contract Documents, unless such deviations are specifically approved by Architect in writing. Provide additional mockups for repair conditions noticed on the floor slabs to be polished.
   1. Polish 100 ft square floor area for each polished finish type.
      a. When there is an appropriate area available, and if approved by Architect, mock-ups may be constructed on areas of floor slab not scheduled for polished concrete floor finish, provided that the mock-ups will be concealed by other flooring systems as scheduled, and the mock-up will not adversely affect the installation or performance of the scheduled flooring system for that area. Confirm available locations for such mock-ups prior to pouring slabs to be polished, with Architect and with installer(s) of other flooring system(s). Otherwise, provide temporary minimum size [10'x10']x4" thick concrete pads for mock-ups, poured at same time and of same material as the concrete floor slabs to be polished.
      b. When there is an appropriate area available, and if approved by Architect, mock-ups for repair procedures may be constructed on areas of floor slab not scheduled for polished concrete floor finish, provided that the mock-ups will be concealed by other flooring systems as scheduled, and the mock-up will not adversely affect the

installation or performance of the scheduled flooring system for that area. If the slab exhibits cracks of a similar nature to cracks existing in the temporary mockup slab, then perform crack repair mockups on the temporary slab.

2. Use the same personnel, including supervisors, which will perform the Work.
3. Install products and materials according to specified requirements and same installation procedures to be used in installation of the Work.
4. Work shall be representative of those to be expected for the Work.
5. Show maximum variation that will be expected to exist in the completed Work.
   a. If there is cracking evident in floor slabs to be polished at time of polishing mock-ups, include crack repair examples in the initial mockups.
   b. Provide mockups for all surface imperfections or surface damage repairs evident in the slab as directed by Architect, at the time that such conditions are observed to exist. It is the intent of these specifications that all surface imperfections in the living quarters and in all areas of polished concrete floor finish will be patched as part of the base scope of the work, whether or not the surface imperfections are caused by non-conforming work. Architect shall have discretion to determine which types of surface imperfections will or will not be patched based on results of mockup reviews.
6. Approval is for the following aesthetic qualities:
   a. Compliance with approved submittals.
   b. Uniformity or intended effect of exposed aggregate.
   c. Uniformity of sheen.
7. Obtain Architect's approval before starting work on Project.
8. Maintain field mock-ups during construction in an undisturbed condition as a standard for judging completed Work.
9. Do not demolish, alter, or remove field mock-ups until acceptable to Owner and Architect.
10. When directed, demolish and remove field mock-ups from Project.

F. Pre-Installation Conference: Prior to placing concrete for areas scheduled for polished concrete floor finish, conduct conference at Project to comply with requirements of applicable Division 01 Sections.
   1. Required Attendees:
      a. Owner's representative.
      b. Architect.
      c. General Contractor, including superintendent for this project.
      d. Concrete Floor Polishing System Certified Applicator, including the supervisor for this project.
      e. Concrete Floor Polishing System Manufacturer's field representative.
   2. Minimum Agenda: Floor Polishing System Applicator, and other related trades as applicable, shall demonstrate understanding of work required by reviewing and discussing procedures for, but not limited to, following:
      a. Discuss and evaluate compliance with Contract Documents, including substrate conditions, surface preparations, sequence of installation and other preparatory Work performed by other installers.
      b. Review approved submittals.
      c. Review installation procedures, including, but not limited to:
         1) Environmental requirements.
         2) Concrete finishing.
         3) Curing methods.
         4) Surface preparation.
         5) Construction Joints
         6) Application and Installation of decorative saw cuts.
         7) Repair Procedures.
         8) Field quality control procedures and requirements.
         9) Cleaning.
         10) Protection of polished concrete.
         11) Coordination with other work.
         12) Maintenance.
   3. Minutes: General Contractor shall record discussions, including decisions and agreements reached, and furnish copy of minutes to each party attending.

G. Field Quality Control Conferences: Should deficiencies or complications arise requiring a field quality control conference with the Polishing System Manufacturer's Representative, conduct a field quality control conference with adequate notice to same attendees as the Pre-Installation Conference.
   1. Tour mock-ups and representative areas of required work. Discuss and evaluate corrective actions required for compliance with Contract Documents, including substrate conditions, surface preparations, sequence of installation and other repair or preparatory Work performed by polishing system Applicator or other trades.
   2. Manufacturer's field representative shall prepare and issue report to attendees noting decisions made, and follow-up actions and corrective actions required.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original, factory sealed, unopened, new containers bearing manufacturer's name and label intact and legible.

B. Store materials in protected and well ventilated area at temperatures between 40° and 90° degrees F., unless otherwise required by manufacturer. Keep containers sealed until ready for use. Do not use materials beyond manufacturer’s shelf life limits. Protect materials during handling and application to prevent damage or contamination.

1.07 PROJECT CONDITIONS

A. Damage and Stain Prevention: Take precautions to prevent damage and staining of concrete surfaces to be polished.
   1. Prohibit following over concrete surfaces to be polished:
      a. Vehicle parking.
      b. Pipe cutting operations.
      c. Ferrous metals storage.
      d. No eating or drinking activities on the slab.
   2. Protect concrete surfaces to be polished from following:
      a. Petroleum, oil, hydraulic fluid, or other liquid dripping from equipment.
      b. Acids and acidic detergents.
      c. Painting activities.
      d. Diaper all hydraulic lifts and power equipment. UNDER PROTECTION
      e. Do not store steel or materials on concrete to receive Polished Concrete Floor Finish.

B. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting polishing operations.

1.08 WARRANTY

A. Sealer/Hardener: Manufacturer's Standard Ten (10) year material warranty and Certified Applicator’s Ten (10) year labor warranty for Sealer/Hardener, Jointly signed.

1.09 MAINTENANCE MATERIALS

A. At end of project, provide Owner with five gallons of RetroPlate’s CreteClean Plus, or Manufacturer's recommended cleaning product, and latest published Maintenance brochure for proper maintenance.

PART 2 - PRODUCTS

2.01 MANUFACTURER AND PRODUCTS

A. Basis of Design: Contract Documents are based on products as manufactured by Curecrete dba Advanced Floor Products, (800) 998-5664, www.retroplatesystem.com, to establish a standard of quality. Other available products and installation processes having equivalent characteristics and quality control may be considered, provided deviations are minor and does not change concept expressed in Contract Documents as judged by Architect.

1. Penetrating Concrete Sealer / Hardener: Curecrete dba Advanced Floor Products, Springville, UT.
2. Polish Stain Guard, water based copolymer for forced burnishing application: RetroPlate "RetroGuard", or Floor Polishing System Manufacturer's approved equal product.
    a. At Apparatus Bay use penetrating stainguard formulated for oil repellencey; Retro-Pel or approved equal product.
3. Joint Sealant: Curecrete, Springville, UT.
4. Contact: Rhonda Clinton, PSI Permanent Surfaces, 214-522-4047.

2.02 PENETRATING CONCRETE SEALER/HARDENER

A. "RetroPlate 99 Polishing System", or approved equal. Formulated to seal, dustproof, increase abrasion resistance and develop polished appearance to concrete surfaces to which it is applied.
1. Description: Clear liquid form of sodium silicate to permanently seal, dustproof and harden concrete surfaces and provide abrasion resistance by penetrating into concrete pores and chemically reacting. Chemically relies on an internal reaction, leaving no surface film or residue to densify pores. Products containing silicanates, magnesium florasilicates, or potassium silicates will not be acceptable and will not be approved. Products must conform and meet minimum performance characteristics as described herein.
2. Performance Criteria:
    a. Abrasion resistance: ASTM C779 - Up to 400% increase in abrasion resistance.
    b. Impact Strength: ASTM C805 – 21% increase impact strength.
    c. Ultra Violet Light and Water Spray: ASTM G23-81 – No adverse effect to ultra violet and water spray.
    d. Coefficient of Friction: ASTM C1028 – Meet or exceed OSHA and ADA recommendations.
    e. Reflectivity: IG – 310 Gloss Reader Checker – up to 30% increase in reflectivity.
    f. Densification: Achieve waterproofing, hardening, dustproofing, and abrasion resistance of the concrete surfaces while imparting specified sheen.
    g. h. ANSI/NFSI, Ph. 2 "High Traction" Certified; testing for slip co-efficiency as a minimum floor safety standard.

B. Manufacturer’s Technical Representative available to make site visits.

2.03 SYSTEM SCHEDULE

A. **Specialty Concrete, (CON2) (Ground and Polished Concrete)** – RetroPlate 99 Polishing System applied to natural Gray Concrete. Spiff coats: 2 coats of Stainguard.
1. Level of Grinding: Medium Grind / Class B Salt and Pepper Finish.
2. Sheen: Level 2, 400 grit Satin Sheen.
3. Color: Natural polished concrete.

2.04 JOINT SEALANT, SPALL, AND CRACK REPAIR

A. Crack Repair and Joint Sealant products must meet specification requirements for compatibility with Diamond Polished Concrete Floor Finish System as recommended by manufacturer of concrete sealer/hardener. The following products named are for RetroPlate system and to set quality standard.

B. Joint Filler / Sealer: Polishing system Manufacturer's recommended self-leveling elastomer joint filler, "CreteFill Pro Series 85" as manufactured by Curecrete of Springville, Utah, or approved equal.
1. ASTM D-2240, Shore A hardness.
2. Rated for heavy vehicle traffic.
3. Resistant to petrochemicals.
4. Remains flexible, including in cold temperatures.
5. Color: Standard Gray at natural (un-dyed) polished concrete

C. Spall and Crack Repair for concrete patching: Polishing system Manufacturer's recommended high strength, hybrid urethane repair material, "CreteFill Crack Repair" and "CreteFill Spall Repair", as manufactured by Curecrete of Springville, Utah, or approved equal.
1. Can be color-matched to adjacent concrete.

2. Other type products may be considered if they are demonstrated by mockup to produce superior results.

2.05 ACCESSORIES

A. General: Accessories required for application of Colored Concrete Dye and Diamond Polishing System: Provide in accordance with floor finish system Manufacturer's instructions, including thinners.

B. Neutralizing Agent:
   1. Trisodium Phosphate.
   2. Ammonia.

C. Water: Potable.

D. Protective Covers: Use protective membrane and cover boards approved by Concrete Floor Polishing System Manufacturer. Do not use coverings that are impermeable or would trap moisture in or on the slab surface. Subject to compliance with requirements and Manufacturer's approval, provide the following products:
   1. Protective Membrane:
      a. Liquid-Protection Membrane: Primer-adhered, protective membrane coating: Water Vapor Permeable, breathable membrane system. Liquid primer/adhesive designed to release from smooth concrete floor for polished floor applications without staining or leaving a residue. "Skudo HT" by Skudo USA, or approved equal.
   2. Membrane Cover Board
      a. Plywood: Nominal 1/2", plywood.
         1) Replace as required due to warp or damage by the elements.
      b. Install double-layer of plywood, 1/2" over 1/2", with staggered joints and screwed together with screws that are not long enough to penetrate through the lower layer of plywood.
         1) Cut edges of plywood exposed to heavy construction traffic at an angle in order to trip hazard and to facilitate rolling traffic.

2.06 POLISHING EQUIPMENT

A. Field Grinding and Polishing Equipment:
   1. Variable speed, 3 or 4 head counter-rotating, walk-behind machine with not less than 600 lbs of down pressure on grinding or polishing pads.
   2. Dust extraction equipment with flow rate suitable for dust generated, with pre-separator and squeegee attachments.
   3. At slabs with questionable flatness level, use grinding equipment with rotating heads, to minimize uneven aggregate exposure patterns.
   4. Wet vac system to remove slurry and grinding residue for wet grind.

B. Edge Grinding and Polishing Equipment: Hand-Tool or single head walk-behind machines which produces same results, without noticeable differences, as field grinding and polishing equipment.

C. Burnishing Equipment: Single head high speed walk-behind machines; minimum of 2,600 rpm’s.

D. Grinding Pad Discs: Metal bonded discs with embedded industrial grade diamonds of varying grits fabricated for mounting on equipment.

E. Polishing Pad Discs: Resin bonded discs with embedded industrial grade diamonds of varying grits fabricated for mounting on equipment.

F. Burnishing Pads: A-pads or Twister pads coated with embedded industrial grade diamonds for use with burnishing equipment.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Protection article for protection requirements.

B. Acceptance of Surfaces and Conditions: Examine substrates to be polished for compliance with requirements and other conditions affecting performance. If substrate preparation is the responsibility of another installer, notify General Contractor of unsatisfactory preparation before proceeding. Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents. Starting Work within a particular area will be construed as acceptance of surface conditions.

C. Where surface cracking or other conditions requiring repairs are observed, provide additional mock-ups to review results of each proposed repair process.

D. Substrate limitations:
   1. Allow new concrete to cure a minimum of 21 days before starting initial grind.
   2. Allow new concrete to cure a minimum 45 days at 75 degrees prior to application of Polished Concrete Floor Finish. All new concrete to receive Colored Concrete Dye colors must be cured with curing methods as recommended by Manufacturer of Polished Concrete Floor System. Verify compatibility prior to application of curing.
   3. Verify that sub-floor surfaces are smooth and flat within tolerances specified in Section 03300 and are ready to receive Polished Concrete Floor Finish. Verify that the concrete floor is a minimum Flatness of 40 and Levelness of 35.
   4. Apply Polished Concrete Floor Finish minimum 15 days prior to installation of baseboard, equipment and prior to substantial completion.
   5. Notify Architect or Owner's Representative of any pre-existing conditions upon removal of floor coverings, if any unforeseen problems occur prior to proceeding with Polished Concrete Floor Finish. Once work has commenced, the Applicator accepts full responsibility of the outcome of the floor.

3.02 SURFACE PREPARATION OF CONCRETE FLOORS

A. General:
   1. Remove curing, sealing and coating agents, floor coverings, baseboard, mastic, oil, breaking compound residue, any surface contaminants, wax and grease by mechanically or chemically removing; to remove all surface contaminants and to assure penetration of product into surface. Remove mildew by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water. All concrete surfaces receiving Polished Concrete Finish shall be properly neutralized prior to applying densifier to prevent cross contamination and whiting.
   2. Remove dust and loose material by brushing, sweeping, vacuuming, and blowing with high pressure air.
   3. Remove paint residue with solvent/stripper provided the stripper does not have an acidic pH.
   4. Remove tire marks or any residue that will affect the appearance of the floor. Do not seal in any contaminants.
   5. Power scrub and rinse entire floor surface to thoroughly rinse and remove all soap residue or contaminants. Squeegee dry.

B. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, visible staining and all other foreign contaminants.

C. Allow concrete time to cure before beginning initial grinding of slab, 21 days minimum and as recommended by polishing manufacturer.

D. Protect surrounding and adjacent surfaces in manner recommended by Polished Concrete Floor Finish manufacturer. Do Not contaminant or Damage equipment, furniture or adjacent, surrounding surfaces with equipment, Concrete or Sealer/Hardener. Any damage that occurs as a result of poor workmanship shall be replaced and/or repaired by the Certified Applicator and installers.

E. Begin initial grinding while the concrete slab is wide open, prior to wall Acid Stain and the building is dried in. Coordinate general contractor and with other trades. Aggregate exposure shall be kept to a minimum unless specified and Mock-Up is otherwise authorized and approved by Architect or Owner's Representative. Grind and take floor up to 400 Grit using wet grinding methods except for upper level installations. Above the First Floor shall be a DRY grind and polish.

Complete Polished Concrete Floor Finish installation at the end of the project, nearing completion. Polish concrete floor surfaces with power disc machine; sequence with coarse grit to fine abrasive recommended by the Polished Concrete Floor Manufacturer's guidelines to complete the specified aggregate exposure and level of sheen as specified and scheduled herein. Utilize manufacturer's recommended equipment and polishing diamonds for installation of specified floor system using Manufacturer's seven step diamond polishing process. All slurry residue shall be completely removed leaving behind a clean, non-whiting surface. Apply concrete dye in the correct sequence with Manufacturer's installation instructions.

F. All interior exposed concrete surfaces to receive Polished Concrete Floor Finish shall have RetroGuard spiff coats, or Manufacturer's equivalent.

G. Fill joints and use joint filler, spall and crack repair materials in strict accordance with manufacturer's guidelines. Install and coordinate in proper sequence with polishing system specified herein.

H. Treating Surface Imperfections:
   1. Prepare and clean patch areas according to Repair Material and Polishing System Manufacturers' instructions.
   2. Mix patching compound and grout material with dust created by grinding operations to match color of adjacent concrete surface (or other color match process as recommended by repair materials Manufacturer and approved by polishing system Manufacturer and Architect).
   3. Fill surface imperfections including, but not limited to, holes, surface damage, all cracks including small and surface micro cracks, air holes, pop-outs, spalls, and other voids. Perform work to match results of approved repair mock-ups.
   4. Work compound and treatment until color differences between concrete surface and filled surface imperfections are not noticeable.

I. Grout and Repair Grinding:
   1. Repair and grind concrete surfaces in proper sequence according to Polishing System Manufacturer's recommendations.
   2. Use grinding equipment and appropriate grit grinding pads, matching floor polishing system or otherwise in accordance with Polishing System Manufacturer's recommendations.
   3. While applying fresh grout material prior to final polishing, grind concrete in direction perpendicular to initial grinding as required to remove scratches and leave consistent pattern ready for final polish grinding.
   4. Vacuum floor using squeegee vacuum attachment.

J. Grind protrusions flush with surface. Patch voids, holes and cracks with recommended spall and crack repair patching compound that is compatible with sealer/hardener, concrete dye and Polished Concrete Floor Finish as specified herein.

3.03 DECORATIVE CUT JOINTS, PATTERNS

A. Saw cut and route decorative joint patterns as soon as possible after concrete pour.

B. Use concrete saw cutting equipment with fine diamond blade approved by sealer/hardener manufacturer. Sawcuts shall be clean and with sharp edges. Do not allow saw cuts to run out beyond intended sawcut pattern outlines. Jagged edges or gouges shall be patched and repaired as is deemed necessary by the Architect or Owner's Representative. Sawcuts shall be outlined and presented to Owner's Representative for Approval prior to proceeding with actual cut. Pattern shall be placed in Decorative Pattern in approved colors as Detailed on Drawings and by Approved Mock-Up.

C. Layout of decorative pattern using blue chalk and/or pencil. Trace pattern with template, straight edge, or french curve to achieve specified pattern as detailed on drawings. No red chalk or permanent markings allowed. Do not apply any tape, adhesives, or other materials to floor that will leave a residue or that could adversely affect the floor finishing.

3.04 CONCRETE POLISHING APPLICATION

A. Initial Grinding: Polished Concrete Floor Finishes shall be taken up to a 400 grit prior to the walls being installed while the slab is wide open and dried in, coordinate with the General Contractor and other trades. Grind concrete to specified aggregate exposure imparting uniform scratch pattern in concrete. Vacuum floor using squeegee vacuum attachment.
   1. Surface grind / Class A Cement Fines, Cream finish: Minimal grind to achieve polish level, producing cream finish with minimal aggregate exposed.
   2. Medium Grind / Class B Fine Aggregates, Salt and Pepper Finish: Medium grind to achieve even level of aggregate exposure across the floor surface, producing a mix of cream and aggregate exposure to salt and pepper effect as approved by mockup review.
   3. Deep grind / Class C Course, large exposed aggregate: Deep grind to achieve even level of exposure of larger aggregate across the floor surface, to desired effect as approved by mockup review.

B. General:
   1. Apply sealer/hardener and colored concrete dye with application equipment and polishing diamonds as recommended by Polished Concrete Floor Finish manufacturer for each system scheduled herein.
   2. Manufacturer's Certified Applicator to install specified polishing system in strict accordance with manufacturer's recommended polishing grits for each intended sequence to achieve the Polishing System, and specified level of sheen. Manufacturer's same Certified Applicator shall install concrete dye when used in conjunction with the Polishing System.
   3. Contact Manufacturer's Technical Director or Owner's Representative with any questions.
   4. Comply with recommendations of product manufactured for drying time between succeeding coats.
   5. Remove Polished Concrete Floor Finish defects due to poor workmanship, visible and unacceptable to Manufacturer's Representative, Architect or Owner's Representative and RE-install to achieve satisfactory results.
   6. Make edges of Polished Concrete Floor Finishes adjoining other materials clean and sharp. Detail the edges located at the base of the wall, around corners, adjacent surfaces, and all horizontal floor surfaces to match Polished Concrete Floor Finishes to provide a uniform finish to include Polished Concrete Floor Finish, color and sheen per the Approved Mock-Up..
   7. Do Not Apply Tape to Polished Concrete Finish as this will damage or etch surface and the entire system will have to be Re-Done.
   8. Begin grinding and polishing with Polished Concrete Floor Finishes Manufacturer's recommended coarse diamond grit in uniform manner and proceed to next level of polishing diamond grit sequence to complete the Polishing System to match Approved Mock-Up for Aggregate exposure, Polished Concrete Floor Finish, Color, and Sheen.
   9. Complete all work in accordance with the Contract Documents.

C. First Coat: liquid Sealer/Hardener applied at approximately 200 SF per gallon applied to new and existing cured concrete. Applied and used in conjunction with Polished Concrete Floor Finishes. Applied in strict accordance with Manufacturer's latest published instructions for each intended floor finish and surface. If whiting occurs, remove and Repeat steps.

D. Polishing Steps:
   1. Polish to provide indicated level of sheen and finish.
      a. Level 1 Flat Sheen: 100 grit and as required to achieve uniform sheen to match approved mock-up.
      b. Level 2 Satin Sheen: 400 grit and as required to achieve uniform sheen to match approved mock-up.
   2. Thin and apply as recommended by Manufacturer and apply 2 coats of RetroGuard, or Polishing System Manufacturer's equal product, allowing adequate curing time between coats. Exception: Apply RetroPel as specified herein for Apparatus Bays.
   3. Burnish each coat, with high-speed propane burnisher capable of 2,600 rpm's, equipped with manufacturer's recommended burnishing pads. A-Pads or Twister Pads shall be used to complete Polished Concrete Floor Finish using appropriate grit for each intended level of sheen specified herein.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Manufacturer's representative to be available to provide technical assistance and guidance for surface preparation and application of floor finish system when assistance is requested. (Refer to Quality Assurance article in Part 1 of these specifications).
   1. Pre-Construction Conference.
   2. Field Visits as may be requested by Polishing System Applicator.
   3. Quality Control Conferences to address specific issues encountered, should a conference be deemed necessary by Manufacturer's Representative, Applicator, General Contractor, Architect, or Owner's Representative.

3.06 PROTECTION

A. Protect concrete floors to be polished before initial grinding as indicated in the paragraphs below and until final polishing operations, as required to prevent grease, oil, and other contaminants that would adversely affect floor polishing results. Do not allow lifts, wheeled vehicles, or other equipment that could leak oil or other chemicals, over slabs to be polished without protection in place. After initial grinding immediately install floor protection membrane [and cover board] indicated below to protect the slab during construction activities adjacent and above polished slabs. Final grinding and polishing should not begin until other construction activities, including painting and other finishes, adjacent and above polished slabs have been completed. If construction activities will continue in the polished concrete slab areas after final grinding and polishing reinstall protection membranes and cover board protections.
   1. Install approved membrane floor protection covering continuously over concrete area to be polished according to Manufacturer's installation instructions as soon as possible after initial grinding operations are complete but not sooner than 21 days after concrete pour, or longer where recommended by membrane protection product manufacturer or polishing system Manufacturer.
      a. In the event that the project schedule does not allow membrane installation before proceeding with other work over the slab, temporarily install untreated plywood over taped kraft paper, or other approved temporary protection measure until application of protection membrane.
   2. Install protection board continuously over membrane floor protection as soon as possible after protection membrane is installed. Remove and replace warped material upon building dry-in and when protection board becomes warped to the point that construction traffic over warped boards may damage protection membrane or the concrete slab.
   3. Diaper lifts and equipment to prevent oil, gas, and contaminants from staining slab.
   4. Do not use red pencil for laying out walls in areas of polished slab, or other markings that can stain the slab or leave visible lines. Blue is generally acceptable, confirm acceptable marking materials with Manufacturer.
   5. Do not use tape or other adhesive attachments to secure floor protection to unfinished concrete slab unless Concrete Floor Polishing System Manufacturer and Installer approve use of the specific tape or products to be used.
   6. Should the protective membrane be inadvertently damaged, inspect for damage or spills that may have contaminated the slab. If evidence of spills are observed, immediately clean the slab as recommended by Manufacturer for best results. Install Kraft paper with taped joints over protection membrane and concrete slab in the area of damage and replace protection boards.
   7. After floor polishing operations are complete, if there is any construction activity continuing over polished floors that poses a risk of physical damage than those areas should be protected with a minimum of masonite or hardboard taped together at the edges.
   8. Maintain and modify protective covers as may be required throughout construction until removed for final polishing operations.

B. Take care to avoid physical damage to floor slab from construction operations such as dropped tools or other heavy equipment.

C. Do not allow pipe cutting, storage of steel, or sharp objects, and other materials to come into direct contact with slab that will cause discoloration or staining to slab.
   1. Where pipe cutting over slab is unavoidable, provide plywood and other protection as required to prevent damage and staining of concrete surface.

D. General Contractor and Applicator shall prohibit traffic on Polished Concrete Finish at times and durations according to Manufacturer's instructions. In each instance, Applicator shall confirm readiness of floor, including protection in place when required, before traffic is allowed to resume.
   1. Provide "Wet Paint" signs as required to protect newly polished and sealed finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of polishing operations. Barricade areas to protect Concrete Floor Polishing System until properly cured for traffic according to Manufacturer's instructions and recommendations.
   2. Protect and Cover Concrete Floor Polishing System with materials that are recommended by Manufacturer during construction to protect from damage and debris. Do not apply Tape to the Polished Concrete finish at any time. Protect with a breathable covering such as non-marking Kraft paper or equal as recommended by the Manufacturer.
   3. Protect and Cover only after Concrete Floor Polishing System has fully cured and is ready to be covered.

E. Take extra precautions to protect Polished Concrete Floor Finish at any stage of the installation to produce the best possible results.

F. Protect finished Work with protective coverings, from subsequent construction activities posing risk of damage to finished floor.
   1. Where construction operations that could cause physical damage to polished floors will occur after polishing operations, install protection board over kraft paper that is adequate to protect against damage from dropped tools, lifts, equipment, and other applicable hazards.

3.07 REPAIRS

A. Refinish all work which has become damaged or defaced during the course of construction and leave all finishing in clean, neat, and perfect condition, acceptable to the Owner’s Representative. Repair or replace all damaged materials directly attributable to work under this Section.

3.08 CLEANING AND ACCEPTANCE

A. Clean floor, and adjacent surfaces as required, prior to inspection using Manufacturer's recommended cleaners and methods.
   1. Touch-up and restore finish where damaged.
   2. Remove spilled, splashed or splattered finish material from all surfaces, as required.
   3. Do not mar surface finish or item being cleaned. Make necessary repairs to damaged surfaces caused by cleaning operation or installation of Polished Concrete Finish.
   4. Leave storage space clean and in good condition required for equivalent spaces in project.
   5. During progress of work, remove from project daily all discarded materials, rubbish, containers, etc.
   6. Do not permit the use of water or cleaning agents at any time on completed Polished Concrete Floor Finish until said period of time is acceptable to Manufacturer’s Representative and surfaces have cured for a minimum of seven (7) days, or longer where recommended by Manufacturer.
   7. Contact Polished Concrete Floor Finish Manufacturer’s Representative for detailed instructions.

B. Final acceptance of Polished Concrete Floor Finish and Sealer shall be based upon inspection by the Architect and Owner’s Representative. Polished Concrete Floor Finish and Sealer falling below specified and/or scheduled finish and approved Mock-up shall be re-done as required without additional expense to the Owner.

C. Remove temporary mockup slabs after acceptance.

END OF SECTION 03 35 36

SECTION 04-2000 – UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:
   1. Concrete masonry units (CMU's).
   2. Clay face brick.
      a. Basis of Design
      b. Performance Requirements
   3. Mortar and grout.
   4. Reinforcing steel.
   5. Masonry joint reinforcement.
   6. Ties and anchors.
   7. Embedded flashing.
   8. Miscellaneous masonry accessories.
   9. Masonry-cell insulation.

B. Related Sections include the following:
   1. Division 07 Section - Fluid Applied Membrane Air Barriers for membranes applied to exterior face of gypsum sheathing at exterior masonry cavity walls.
   2. Division 07 Section – Water and Vapor barriers.
   3. Division 07 Section - Flashing and Sheet Metal for exposed sheet metal flashing.
   4. Division 07 Section - Firestopping for firestopping at openings in masonry walls.
   5. Division 07 Section - Joint Sealants for sealing control and expansion joints in unit masonry.
   6. Division 07 Section - Building Insulation for cavity wall insulation.

C. Products furnished, but not installed, under this Section include the following:
   1. Dovetail slots for masonry anchors, installed under Division 03 Section - Cast-in-Place Concrete.

D. Products installed, but not furnished, under this Section include the following:
   1. Steel lintels and shelf angles for unit masonry, furnished under Division 05 Section – Structural Steel.
   2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 07 Section - Sheet Metal Flashing and Trim.
   3. Cast-stone trim in unit masonry.
   4. Cavity wall insulation

1.03 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing horizontal reinforcing and vertical steel reinforcing in grouted cells.

C. MCAA: Masonry Contractors Association of America

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: For the following:
   1. CMUs.
   2. Clay face Brick.
   3. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   4. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
   5. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
C. Samples for Verification: For each type and color of the following:
   1. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
   2. Weep holes/vents.
   3. Accessories embedded in masonry.
D. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
   1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
E. Qualification Data: For testing agency.
F. Installer Qualifications: Submit evidence of contractor state license, MCAA company certification and personnel training and experience in constructing masonry structures of similar nature to this project, with a minimum of 5 years of on the job successful construction experience. List project superintendent for masonry work's, experience, training and certifications.
G. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
   1. Masonry units.
      a. Include material test reports substantiating compliance with requirements.
      b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
      c. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
      d. For exposed brick, include test report for efflorescence according to ASTM C67.
   2. Cementitious materials. Include brand, type, and name of manufacturer.
   3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
   4. Grout mixes. Include description of type and proportions of ingredients.
   5. Reinforcing bars.
   6. Joint reinforcement.
   7. Anchors, ties, and metal accessories.
H. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.
   2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

I. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Applicator's Qualifications:
   1. Supervision: Maintain competent supervisor who is at Project during times specified Work is in progress, and, who is experienced in installing systems similar to type and scope required for Project.
   2. Experience: Company licensed in the State where the work will be performed and a MCAA certified company in good standing with not less than 5 years continuous experience under the current name in performing specified work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance; and with sufficient production capability, facilities, and personnel to produce required Work.
   3. Upon request, submit list of a minimum of 5 completed projects of comparable or greater size and complexity to this Work. Include for each project:
      a. Project name and location.
      b. Name and contact information for Owner.
      c. Name and contact information of General Contractor (if applicable).
      d. Name and contact information of Architect.
      e. Date of completion.

C. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

D. Source Limitations for Mortar Materials: Obtain mortar ingredients for each type exposed unpainted masonry of a uniform quality, including color, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section - Project Management and Coordination.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.07 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.02 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.03 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.04 CONCRETE MASONRY UNITS (CMU'S)

A. Shapes: Provide shapes indicated and as follows:
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, partial height wall caps, bonding, and other special conditions.
   2. Provide custom shapes for all outside corners that are not 90 degrees.
   3. Provide bullnose units at all exposed interior outside corners, including corners of door and window openings, of finished CMU walls and bullnosed blocks with solid top at CMU window sills not indicated to receive other sill material on top of the CMU sill.
      a. Bullnoses may be site-tooled for standard and burnished block provided mockups for site tooling and finishing are approved by Architect.
      b. Provide square-edged units for other outside corners, unless otherwise indicated.

B. Concrete Masonry Units: ASTM C 90.
   1. Unit Compressive Strength: Per Drawings.
   2. Weight Classification: Normal weight, unless otherwise indicated.
   3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
   4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.05 BRICK

A. General: Provide shapes indicated and as follows with exposed surfaces matching finish and color of exposed faces of adjacent units:
   1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
   2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
   3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
   4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
   5. Provide custom shapes at all outside, non-ninety degree corners.

B. Clay Face Brick: Facing brick complying with ASTM C216.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Type A:
         1) Yankee Hill
         2) Dark Red Velour
      b. Type B:
         1) Yankee Hill
         2) Capital Iron Spot Velour
   2. Grade: SW.
   3. Type: FBX.
   4. Initial Rate of Absorption: Less than 30 g/30 sq. in.30 g/194 sq. cm per minute when tested according to ASTM C67.
   5. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
   6. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand fifty (50) cycles of freezing and thawing according to ASTM C67 with no observable difference in the applied finish when viewed from ten (10) feet3 m or shall have a history of successful use in Project's area.

7. Size (Actual Dimensions): 3-5/8 inches92 mm wide by 2-1/4 inches57 mm high by 7-5/8 inches194 mm long.
8. Application: Use where brick is exposed unless otherwise indicated.

2.06 MASONRY LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.07 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type IL. Provide natural color cement with pigments as required to produce mortar color indicated:
   1. As selected by Architect from full range of available colors.
B. Hydrated Lime: ASTM C 207, Type S.
C. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs only, containing integral water repellent by same manufacturer.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. ACM Chemistries, Inc.; RainBloc for Mortar.
      b. BASF; MasterPel 240 Mortar Admixture.
      c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
D. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
E. Aggregate for Grout: ASTM C 404.
F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. BASF Corp. - Construction Chemicals.
      b. Euclid Chemical Company (The); an RPM company.
G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
   1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
      a. ACM Chemistries.
      b. BASF Corp. - Construction Chemicals.
      c. Euclid Chemical Company (The); an RPM company.
H. Workability Additive (Face Brick only): "A" Marble Dust by Armco Steel Corp., 90/200 Mineral Filler by Limestone Products.
I. Water: Potable.

2.08 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Stainless Steel Type 304.
3. Wire Size for Side Rods: 0.187-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Wire Size for Veneer Ties: 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods, unless otherwise noted in Structural Drawings or Specifications.

D. Masonry Joint Reinforcement for Multiwythe Masonry:
1. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe unless otherwise noted in Structural Drawings or specifications, and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
2. Available products:
   a. Dur-O-Wall; Truss design DA3700 Dur-O-Eye.
   b. Wire-Bond; Series 900 Level Hook and Eye Truss.

2.09 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.
1. Stainless Steel, Type 304, ASTM A580/ASTM 580M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section for Concrete: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.053-inch- thick, steel sheet, galvanized after fabrication.

D. Adjustable Masonry-Veneer Anchors at metal studs
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
   a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
2. Masonry Anchors for Uncoursed or Random Coarsed Stone Masonry at CMU Back-up: Galvanized ties that are bent in the form of triangular loops designed to be attached to masonry joint reinforcement with vertical wires passing through ties and through eyes projecting from masonry joint reinforcement.
   a. System provides for vertical adjustment for stone pattern indicated in Division 04, Section “Stone Masonry”.
   b. Available Products:
      1) Hohmann & Barnard, Inc,; HVR-295 V.
      2) Wire Bond; Stone Tab Ladder.
3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
   a. Anchor Section: Rib-stiffened, sheet metal plate with screw holes top and bottom, and having slotted holes for inserting vertical legs of wire tie specially formed to fit anchor section.

b. Fabricate sheet metal anchor sections and other sheet metal parts from 0.067-inch-thick, Stainless Steel, Type 304, ASTM A580/ASTM 580M.
c. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188-inch-diameter, Stainless Steel, Type 304, ASTM A580/ASTM 580M.
d. Available Products: Basis of Design Product**[s]** are:
1) For Coursed Masonry: Hohmann & Barnard, Inc.
a) X-Seal Anchor
b) HB-213-2X Anchor
c) Provide with membrane flashing tape at air barrier, provided and installed under Division 07 "Air Barrier" Section(s), or : Hohmann & Barnard, Inc. X-Seal Tape may be substituted if allowed by air barrier manufacturer.

4. Stainless-Steel Drill Screws for Steel Studs: Proprietary fastener consisting of carbon-steel drill point and 300 Series stainless-steel shank, complying with ASTM C 954 except manufactured with hex washer head and neoprene washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads.
a. Available Products:
1) Dayton Superior Corporation, Dur-O-Wal Division; Stainless Steel SX Fastener.
2) ITW Buildex; Scots long life Teks.

2.10 EMBEDDED FLASHING MATERIALS

A. Flexible Flashing (Copper Composite): For flashing not exposed to the exterior, use the following, unless otherwise indicated:
1. Copper-Laminated Flashing: ASTM B370, CDA Alloy 110, 3-oz./sq. ft. copper core laminated polymer fabric on both sides with non-asphaltic adhesive. Extend flashing past face of veneer and trim flush after inspection.
a. Product:
1) York Manufacturing, Inc.; York Copper Fabric Flashing, "Multi-Flash 500".
2) STS Coatings, Inc.; Wall Guardian Copper TWF
3) Wire-Bond, Inc.; Copper Seal
2. Copper Laminated Flashing shall not be used for any flashings that will be exposed to view in the completed work. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for material type(s) for embedded flashings that are exposed to view or partially exposed to view. General Contractor shall coordinate responsibility to provide and install other flashing types.

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
1. One part 100% solids, solvent-free formulated silyl-terminated polyether (STPE), ASTM C920-11, Type S, Grade NS, Class 50, York "Universeal US100" or equivalent.

C. Termination bars: Provide stainless steel termination bars in cavity walls where copper flashing will be installed with termination bars to concrete block backup and with waterproof sealant to protect top side of terminations refer to Division 07 section on "Sealant".
1. Do not use termination bars at face of sheathing unless specifically detailed otherwise in the Drawings. Through-wall flashings at stud construction shall extend through and turn up behind exterior sheathing and ci insulation. Air barrier system materials (per Division 07 Air Barrier Sections) shall lap over and down the face of the through-wall flashings.
2. Termination Bars for Flexible Flashing: #304 Stainless steel sheet 0.090 inch by 3/4 inches minimum with a 3/16 inch minimum sealant flange at top, 8 inch oc pre-punched bolt holes minimum.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. OMG Roofing Products

b. Hohmann & Barnard, Inc. (T1 with Foam-Tite option)
c. Wire-Bond.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products:
   1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
      a. Available Products:
         1) Advanced Building Products Inc.; Mortar Maze weep vent.
         2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
         3) Heckmann Building Products Inc.; No. 85 Cell Vent.
         4) Hohmann & Barnard, Inc.; Quadro-Vent.
         5) Wire-Bond; Cell Vent.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
   1. Provide one of the following configurations:
      a. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.
      b. Strips, not less than 1-1/2 inches thick and 10 inches wide, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.
   2. Available Products:
      a. Advanced Building Products Inc.; Mortar Break II.
      b. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
      c. Mortar Net USA, Ltd.; Mortar Net.

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.
   1. Available Products:
      a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
      b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
      c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
      d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.
   2. In event of conflict with reinforcing bar positions required in Structural Drawings, provide type indicated in Structural Drawings.

2.12 MASONRY-CELL INSULATION

A. Cellular plastic foam insulation comprised of spray-dried polymeric resin and a foaming catalyst concentrate which are combined with water and then injected, along with compressed air, into the wall cavity by the installer. Subject to compliance with requirements, provide CoreFoam as manufactured by cfiFOAM, Inc, or approved equal:
   1. ASTM E-84 Surface Burning Characteristics
      a. Flame Spread 25 or less.

b. Smoke Generated less than 450.
c. Thickness 3.5 inches (maximum test thickness)
d. Flammability Classifications: Class A

2. R-value 4.0-5.0 (hr ft^2 ˚F in)/BTU; 4.92 per inch at 25 ˚F.
3. Density upon final curing: 0.5-1.0 lb / ft^3.
4. Install in all cells of exterior walls between conditioned space and building exterior, except for grouted cells.
   a. At acoustical block, provide block with grout shields behind the acoustical fill material.

B. Molded-Polystyrene Insulation Units: Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C 578, Type I. Provide total a R-value of 7.6. Provide specially shaped units designed for installing in cores of masonry units.
   1. Available Products:
      a. Concrete Block Insulating Systems; Korfil.
      b. Shelter Enterprises Inc.; Omni Core.

2.13 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned. The use of muriatic acid is prohibited.
   1. Available Manufacturers:
      a. Diedrich Technologies, Inc.
      b. EaCo Chem, Inc.
      c. ProSoCo, Inc.
   2. Do not use materials or methods that can damage masonry finishes. Use only manufacturer's approved products and methods.

2.14 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Limit cementitious materials in mortar to portland cement and lime.
   3. Limit cementitious materials in mortar for exterior masonry to portland cement and lime.
   4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
   1. For masonry below grade or in contact with earth, use Type.S.
   2. For reinforced masonry, use Type S.
   3. For mortar parge coats, use Type S.
   4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.

   5. Incorporate color pigment in mortar according to approved color per mock-up review.

6. Use workability additive for brick masonry.

C. Pigmented Mortar: Use colored cement product.
   1. Application: Use pigmented mortar for exposed mortar joints at all veneer masonry.
   2. Final colors as approved by mock-up review.

D. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
   2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

2.15 SOURCE QUALITY CONTROL

A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:
   1. Payment for these services will be made by Owner.
   2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Clay Masonry Unit Test: For each type of unit furnished, per ASTM C 67.

C. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Contractor is responsible to coordinate between trades prior to concrete slab pours to avoid conflicts with CMU wall construction, including but not limited to the following:
   1. Positions, sizes, and other requirements for locating all reinforcing coming up through slab. Unless otherwise noted in Structural Drawings, post-installation with epoxy anchors is not an equivalent method of installation. Any request to substitute post-installed anchors in masonry construction should be pre-approved by Contractor via RFI to the Structural Engineer of record, and the Structural Engineer may reject requests for such substitution.
   2. Coordinate all conduits and pipes as shown on MEP drawings for concealed installation to greatest extent possible.
   3. Reinforced / grouted cells will not be in conflict with electrical conduits, plumbing pipes, or other items built into CMU cells. This includes the quantity, sizes, and locations to comply with all notes, specific location details, and typical details, as indicated in the Structural Drawings.
      a. A large number of conduits in a line could cause non-compliance with Structural requirements, either for the CMU wall, or in the concrete slab. In areas where many conduits are required for electrical items, request clarification from Architect and

Structural Engineer as to allowable routings of conduits to avoid adverse impact on the structural system.

4. Storm Shelters: Confirm that perimeter walls of the impact-resisting structure of the Storm Shelter complies with the following:
   a. No conduits, pipes, or other similar construction is allowed inside the cells of 8” CMU.
   b. At 12” CMU, Where conduits or pipes are indicated in Drawings to be located inside CMU wall construction, locate them inside the cells of CMU subject to the following requirements:
      1) No pipe or conduit larger than 1” shall be located in any CMU cell of the impact-resisting structure of the Storm Shelter.
      2) Only one pipe or conduit is allowed inside each CMU cell, and all pipe or conduit shall be located tight to the interior wall face of the CMU cell.
      3) Only one recessed wall box is allowed per CMU cell, and all recessed boxes shall be located on the interior side of CMU only.
      4) Additionally, locate pipe and conduit such that it will not interfere with required cell reinforcing.
   c. Any electrical devices indicated in conflict with a. and b. above must have electrical wiring routed to the device(s) within surface mounted raceway. Obtain approval of Architect for routing to minimize visual clutter, including minimizing the number of bends in exposed raceways.
   d. Coordinate specific structural requirements indicated in Structural Drawings and notes for CMU at storm shelter construction, which likely differs from other areas of CMU. Such differences may include, but are not limited to, such things as:
      1) Fully grouted cells throughout
      2) More stringent requirements for cell or bond beam reinforcement
      3) More stringent requirements for size or spacing of horizontal joint reinforcing.
      4) No allowance for use of post-installed anchors, even if other CMU walls are allowed to use post-installed anchors, including by approved substitution requests unless storm shelter CMU is specifically approved by such requests.
      5) No pipe, conduit or other penetration greater than 2” diameter is allowed through the impact-resisting structure without providing impact baffling.
   e. In event of apparent conflicts, notify Architect to confirm the proper resolution.
5. Confirm sill sealer gaskets are installed where studs meet concrete slabs, prior to beginning veneer installation.

3.03 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed. Do not install any cut units at corner conditions.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
   1. Mix units from several pallets or cubes as they are placed.

F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in.30 g/194 sq. cm per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying. Do not wet CMU.

G. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
   1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
   2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
   3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
   4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
   5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
   6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
   7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.04 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items. Install pipes and conduit as shown on MEP drawings, and conceal within masonry cells all locations. Alert Architect to conflicts before installation.

F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
   1. Fill all cores of CMU at storm shelter impact-resisting perimeter walls, and any other locations so indicated in Structural Drawings.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
   1. Install compressible filler in joint between top of partition and underside of structure above.

2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section - Fire-Resistive Joint Systems.

3.05 MORTAR BEDDING AND JOINTING

A. Lay concrete masonry units as follows:
   1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
   2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
   3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
   4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Mortar joints to be tooled (concave), except special joints as detailed.

3.06 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:
   1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
      a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
      b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.
   2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
      a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
      b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement.
      c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement to allow for differential movement regardless of whether bed joints align.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Coat cavity face of backup wythe to comply with Division 07 Section - Bituminous Dampproofing. Where indicated on drawings.

D. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in

cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

E. Membrane Dampproofing: Re: Division 07

3.07 MASONRY-FOAM CELL INSULATION

A. Site Verification: Install after block mortar is adequately cured and do not install when there is water in the cells or block is wet. Install when temperature of wall assembly and other environmental requirements of Manufacturer are met.

B. Install foam cell insulation in masonry unit cells per Manufacturer's instructions. Install insulation after laying units and before installing exterior continuous insulation, finishes, or veneer. Install from top and/or exterior side and patch all core holes. Install foam before applying dampproofing, or patch dampproofing after patching core holes.

C. Field Quality Control:

1. Testing
   a. Verify insulation density by random sampling of foam.
   b. Fill a 12x12x12 box with foam.
   c. Foam weight should be 2 ½ - 3 ¼ lb.
2. Inspection and Correction: Owner and Architect reserve the right to require verification and correction of proper installation as follows:
   a. Owner shall engage an IR technician who is “BlockWallScanIR” certified to perform and interpret infrared scans of all insulated masonry walls. Should any deficiencies be discovered, the Installer shall be responsible to pay all costs for the testing and verification.
   b. Installer shall correct any portion of the foam installation found not to be in compliance with manufacturer’s requirements, at no additional cost to Owner.

D. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.08 CONCRETE MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls, and at storm shelter perimeter walls forming the impact-resistant shell of the Storm Shelter.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
   a. Reinforcement above is in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.09 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing or concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.

2. Insert slip-in anchors in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.
3. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of insulation.
4. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
5. Space anchors as indicated, but not more than 16 inches o.c. vertically and 16 inches o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.
6. Provide self-sealing tape to seal around shaft of screw and legs of anchor at the point of penetration. Unless otherwise indicated in Division 07 “Air Barrier” sections, tape may be applied at each anchor or in continuous vertical strips, however continuous strips are highly recommended where exterior insulation will visually obscure the tape locations at the air barrier.

3.10 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows using one of the following methods:
   1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
   2. Install preformed control-joint gaskets designed to fit standard sash block.
   3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
   4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in veneer made from clay or shale as follows:
   1. Build in compressible joint fillers where indicated.
   2. Form open joint full depth of veneer wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 07 Section - Joint Sealants.

D. Location of expansion joints:
   1. At long walls no greater than 25 feet maximum.
   2. At offsets in walls.
   3. Near corners (10 ft. maximum).
   4. At intersections of walls.
   5. Where short runs of masonry intersect long runs of masonry.
   6. Where materials of different coefficients of thermal expansion are joined.

E. Form open joint full depth of veneer wythe and of width indicated, but not less Provide horizontal, pressure-relieving joints by inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section - Joint Sealants, but not less than 3/8 inch.
   1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.11 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.12 FLASHING, WEEPS, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weeps in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at 2'-0" on center at top of masonry walls shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated. Embed flashing in manufacturer's recommended sealant. Seal lap joints as recommended by manufacturer.

B. Install flashing as follows, unless otherwise indicated:
   1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
   2. At multi-wythe masonry walls, including cavity walls, extend flashing through outer wythe, across air space behind veneer, behind ci insulation and turned up face of bituminous coated masonry inner wythe a minimum of 8 inches. Secure to the inner wythe with continuous termination bar. Seal top of termination bar and install ci insulation over flashing.
   3. At stud-framed walls with masonry-veneer walls, extend flashing through veneer, across air space behind veneer, up face of sheathing at least 8 inches, through sheathing and up back of sheathing a minimum of 4 inches. Install ci insulation and water/vapor barrier over flashing.
   4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends, turn up and fold not less than 2 inches to create a folded end dam, per manufacturers recommendations & literature.
   5. Cut flexible flashing off flush with face of wall after masonry wall construction is completed and reviewed by architect.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weeps in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
   1. Use specified weep/vent products to form weeps.
   2. Form weeps above flashing under masonry sills.
   3. Space weeps 24 inches o.c., unless otherwise indicated.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article. At a minimum, place Mortar Net to a height equal to the height of the first course, but not less than 8 inches. Place immediately above the top of flashings embedded in the wall, as masonry construction progresses, to catch mortar droppings and to maintain drainage.

F. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.
   1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

G. Install sill sealer at sill plate per manufacturer's written instructions.

3.13 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace,

tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections per drawings.

3.15 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry veneer by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Where required clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.16 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
   1. Crush masonry waste to less than 4 inches in each dimension.
   2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section - Earthwork.
   3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

END OF SECTION 04 81 00

SECTION 04-7200 – CAST STONE MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. This specification covers all labor, materials and services incidental to and including the furnishing and setting of all Cast Stone as indicated on the drawings and specified herein.
   2. The Manufacturer shall be responsible for all labor, materials, equipment and services necessary for, and incidental to, providing all Cast Stone covered by this Specification.
   3. The Setting Contractor shall unload, receipt for, protect, store and set all Cast Stone covered by this Specification and shall provide and install all anchors for same.
B. Related Sections:
   1. Division 04 Section - Unit Masonry Assemblies, for miscellaneous masonry accessories.
   2. Division 05 Section - Cold-Formed Metal Framing, for steel stud frames supporting dimension stone cladding.
   3. Division 07 Section - Fluid Applied Membrane Air Barriers, for membranes applied to exterior face of exterior sheathing at exterior masonry cavity walls.
   4. Division 07 Section - Sheet Metal Flashing and Trim, for exposed sheet metal flashing.
   5. Division 07 Section - Firestopping, for firestopping at openings in masonry walls.
   6. Division 07 Section - Joint Sealants, for sealing control and expansion joints in unit masonry.
   7. Division 07 Section - Thermal Insulation, for cavity wall insulation.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces. Tie cast stone locations to building gridlines for verification of dimensions.
   1. Include building elevations showing layout of units and locations of joints and anchors.
   2. Show locations and details of flashing at a scale no less than 3 inches per 12 inches.
C. Samples for Initial Selection: For colored mortar.
D. Samples for Verification:
   1. For each color and texture of cast stone required, 10 inches square in size.
   2. For colored mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicated types and amounts of pigments used.
E. Full-Size Samples: For each color, texture, and shape of cast stone unit required.
   1. Make available for Architect's review at Project site.

1.04 QUALITY ASSURANCE

A. The Manufacturer shall have been a recognized and reputable Cast Stone manufacturer for a minimum of five years continuous operation, and shall have adequate experience, facilities and capacity to furnish the quality, sizes and quantity of Cast Stone required without delaying the progress of the work. The Manufacturer's products shall have been previously used and exposed to the weather with satisfactory results.
B. Standards: Comply with the requirements of the Cast Stone Institute's Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.
C. All Cast Stone used in this work shall be manufactured by cast stone manufacturer and shall have minimum compressive strength of 6500 lbs. per square inch and absorption of no greater than 6% when tested in accordance with the requirements of this Specification.
D. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
E. Source Limitations for Cast Stone: Obtain cast stone units through single source from single manufacturer.
F. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
    1. Build mockup of typical wall area as shown on Drawings.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.
B. Pack, handle, and ship cast stone units in suitable packs or pallets.
    1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
    2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.06 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.
    1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
B. Hot-Weather Requirements: Comply with hot-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.01 CAST STONE MATERIALS

A. General: Comply with ASTM C 1364 and the following:
B. Portland Cement: ASTM C 150, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast stone color indicated.

C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33; gradation and colors as needed to produce required cast stone textures and colors.
D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33, gradation and colors as needed to produce required cast stone textures and colors.
E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
F. Admixtures: Use only admixtures specified or approved in writing by Architect.
    1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
    2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
    3. Air-Entraining Admixture: ASTM C 260. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
G. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast stone material.
    1. Epoxy Coating: ASTM A 775/A 775M.
    2. Galvanized Coating: ASTM A 767/A 767M.
H. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304.

2.02 CAST STONE UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by the one of the following:
    1. Advanced Architectural Stone Inc. (AAS), 115 Lee Street, Fort Worth, Texas 76140, (817) 572-0012 Fax (817) 293-6378, Email: sales@advancedarchitecturalstone.com, URL: www.advancedarchitecturalstone.com.
    2. AHI Supply, LP, 2800 North Gordon, Alvin, Texas 77511, (281) 331-0088 Fax (281) 331-9813, Email: arhoden@ahi-supply.com, URL: www.ahi-supply.com.
    3. Continental Cast Stone of Texas Inc., 101 E Shady Grove Rd, Grand Prairie, Texas 75050, (972) 871-7866 Fax (972) 871-1251, Email: info@continentalcaststone.com.
    4. Stone Castle Industries Inc., 3615 Almeda Genoa, Houston, Texas 77047, (713) 440-6224 Fax (713) 440-6228, URL: www.stonecastleinc.com.
B. Regional Materials: Cast stone units shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
C. Provide cast stone units complying with ASTM C 1364 using either the vibrant dry tamp method.
    1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
D. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
    1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
    2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
    3. Provide drips on projecting elements unless otherwise indicated.
E. Fabrication Tolerances:
    1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
    2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
    3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.

4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

F. Cure units as follows:
   1. Cure units in enclosed moist curing room at 95 to 100 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
   2. Keep units damp and continue curing to comply with one of the following:
      a. No fewer than five days at mean daily temperature of 70 deg F or above.
      b. No fewer than six days at mean daily temperature of 60 deg F or above.
      c. No fewer than seven days at mean daily temperature of 50 deg F or above.
      d. No fewer than eight days at mean daily temperature of 45 deg F or above.

G. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

H. Colors and Textures: As selected by Architect from manufacturer's full range.

2.03 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
   1. Products: Subject to compliance with requirements, provide one of the following:
      1) Davis Colors; True Tone Mortar Colors.
      2) Lanxess Corporation; Bayferrox Iron Oxide Pigments.
      3) Solomon Colors, Inc.; SGS Mortar Colors.

D. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

2.04 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

B. Dowels: 1/2-inch- diameter, round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

2.05 MORTAR MIXES

A. Comply with requirements in Division 04 Section - Unit Masonry for mortar mixes.
   1. Use masonry cement mortar unless otherwise indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SETTING CAST STONE IN MORTAR

A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
   1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
   2. Coordinate installation of cast stone with installation of flashing specified in other Sections.
B. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
C. Set units in full bed of mortar with full head joints unless otherwise indicated.
   1. Set units with joints 1/4 to 3/8 inch wide unless otherwise indicated.
   2. Build anchors and ties into mortar joints as units are set.
   3. Fill dowel holes and anchor slots with mortar.
   4. Fill collar joints solid as units are set.
   5. Build concealed flashing into mortar joints as units are set.
   6. Keep head joints in coping and other units with exposed horizontal surfaces open to receive sealant.
   7. Keep joints at shelf angles open to receive sealant.
D. Rake out joints for pointing with mortar to depths of not less than 3/4 inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
E. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
G. Provide sealant joints at copings and other horizontal surfaces, at expansion, control, and pressure-relieving joints, and at locations indicated.
   1. Keep joints free of mortar and other rigid materials.
   2. Build in compressible foam-plastic joint fillers where indicated.
   3. Form joint of width indicated, but not less than 3/8 inch.
   4. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
   5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Division 07 Section - Joint Sealants.

3.03 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
   1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
   2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.
B. Keep cavities open where unfilled space is indicated between back of cast stone units and backup wall; do not fill cavities with mortar or grout.
C. Fill anchor holes with sealant.
   1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.
D. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.
E. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.
   1. Form open joint of width indicated, but not less than 3/8 inch.

F. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
G. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Division 07 Section - Joint Sealants.

3.04 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
B. Variation from Level: Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

3.05 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
C. In-Progress Cleaning: Clean cast stone as work progresses.
    1. Remove mortar fins and smears before tooling joints.
    2. Remove excess sealant immediately, including spills, smears, and spatter.
D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
    1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
    2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
    3. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

END OF SECTION 04 72 00

SECTION 05-1200 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members.
B. Base plates.
C. Grouting under base plates.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths. Distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain
   5. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.
   6. Identify members not to be shop primed.
C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.
E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

1.03 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
B. Structural steel members designated as architecturally-exposed structural steel (AESS) to also comply with Section 05-1213.
C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and no more than 12 months before start of scheduled welding work.
D. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172. As an alternate to this requirement, the Contractor shall pay for a Quality Assurance Inspector (QAI) during the fabrication of the project steel. The QAI shall perform all steel inspections indicated in the Drawings (see statement of Special Inspections). This inspection will be conducted at the fabrication plant by an inspection agency that is acceptable and approved in writing by the engineer of record.
E. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in State Name.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles, Plates, and bars: ASTM A36/A36M.
B. Steel W Shapes and Tees: ASTM A992/A992M.
C. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade C.
D. Pipe: ASTM A53/A53M, Grade B, Finish black.
E. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.
F. Unheaded Anchor Rods: ASTM F1554, Grade 55, plain with welding supplement S1, with matching ASTM A563 or ASTM A563M nuts and ASTM F436/F436M Type 1 washers.
G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
H. Sliding Bearing Plates: Teflon coated.
I. Shop and Touch-Up Primer: Fabricator's standard, lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat or complying with VOC limitations of authorities having jurisdiction.
J. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
    1. Etching Cleaner: MPI#25, for galvanized steel.
    2. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.
B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.
C. Fabricate connections for bolt, nut, and washer connectors.
D. Develop required camber for members where indicated.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC-SP 2.
B. Shop prime structural steel members - typical. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, high strength bolted, or surfaces to be enclosed in interior construction.
C. Galvanize exterior structural steel members (as indicated in the drawings) to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.

2.04 SOURCE QUALITY CONTROL

A. Provide shop testing and analysis of structural steel.
B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts."
C. Welded Connections: Visually inspect all shop-welded connections and test welds using one of the following, at testing agency's option:
    1. Radiographic testing performed in accordance with ASTM E94/E94M.
    2. Ultrasonic testing performed in accordance with ASTM E164.
    3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
    4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303.
B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
C. Field weld components indicated on shop drawings.
D. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
E. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01-4000 - QUALITY REQUIREMENTS.

END OF SECTION

SECTION 05-3100 - STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Composite floor deck.
B. Supplementary framing for openings up to and including 18 inches.
C. Bearing plates and angles.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittals procedures.
B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
D. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.03 QUALITY ASSURANCE

A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in State Name.
B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.3/D1.3M and dated no more than 12 months before start of scheduled welding work.
C. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.
B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 STEEL DECK

A. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete:
    1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
    2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate (where floor deck is exposed).
    3. Minimum Base Metal Thickness: as indicated in drawings.
    4. Nominal Height: as indicated in drawings.
    5. Profile: Fluted; SDI NR.
    6. Formed Sheet Width: 36 inch.
    7. Side Joints: Lapped, per drawings.
    8. End Joints: Lapped, per drawings.

2.02 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A36/A36M steel, galvanized per ASTM A123/A123M.
B. Welding Materials: AWS D1.1/D1.1M.

C. Fasteners: Galvanized hardened steel, self tapping.
D. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.
E. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
F. Weld Washers: Mild steel, uncoated, 3/8 inch outside diameter, 1/8 inch thick.
G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gauge, 0.0299 inch thick sheet steel; of profile and size as indicated; finished same as deck.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
B. On concrete and masonry surfaces provide minimum 4 inch bearing.
C. On steel supports provide minimum 1-1/2 inch bearing.
D. Fasten deck to steel support members at ends and intermediate supports at 12 inches on center maximum, parallel with the deck flute and at each transverse flute using methods specified.
E. Clinch lock seam side laps.
F. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.
G. Weld deck in accordance with AWS D1.3/D1.3M.
H. At deck openings from 6 inches to 18 inches in size, provide 2 by 2 by 1/4 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
I. At deck openings greater than 18 inches in size, provide steel angle reinforcement. as specified in Section 05-1200.

END OF SECTION

SECTION 05-5000 – METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. General: Furnish all labor, supervision, materials, tools, equipment, appliances and services necessary for the fabrication, delivery and installation of all miscellaneous metal items. All work shall be as shown or indicated on the drawings and as specified in this section.

B. Scope of Work:
1. Embedded angles and plates
2. Guardrails, Handrails, and Handrail Brackets
3. Ladders and safety cages
4. Disappearing Stairways
5. Expansion Joint Covers
6. Steel Countertop Supports
7. Steel Equipment Supports
8. Metal Gratings
9. Steel Plate Covers for Sidewalk Culverts
10. Pipe Guards
11. Downspout Protection
12. Pipe Bollards
13. Steel Gate Frames and metal infill panels
14. Miscellaneous metal work and related items.
15. Shop Priming and Finishing of Metal Fabrications

C. Related Sections include the following:
1. Division 03 Section - Concrete.
2. Division 04 Section - Unit Masonry.
3. Division 06 Section - Rough Carpentry, for concealed blocking for attachment of metal fabrications.
4. Division 08 Section - Access Doors and Panels, for metal floor hatches.
5. Division 09 Section - Painting.
6. Division 09 Section - Special Coatings.
7. Division 11, 23 and other Sections for equipment requiring miscellaneous steel support structure.

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders including engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design Criteria:
1. Ladders designed to withstand live loading conditions of 100 lb. per square feet.
2. Handrails, Guardrails, or other protective enclosures shall be designed to withstand stresses to which they would be normally subjected, and to support a load of 50 lb per linear foot applied perpendicular at the top of the rail or guard, and to withstand a load of 200 lbs. applied in any direction at any point on the top of the rail or guard without deflection.

3. Connections other than those already listed shall be designed to safely support design load (dead load plus live load) of not less than 100 psi without exceeding working stresses permitted for materials.
4. Miscellaneous countertop supports designed to safely support a load of 200 lb per linear foot of countertop applied at the outside edge, as well as any additional requirements as specified in Division 06 Section - Architectural Woodwork.
5. Miscellaneous equipment supports per local code requirements, equipment Manufacturers' requirements and as specified herein.

1.04 QUALITY ASSURANCE

A. Steel stairs in accordance with latest NAAMM Standards and AISC.

B. Welding shall conform to American Welding Society's Standard Code for Arc and Gas Welding in Building Construction. Welding shall be continuous along entire area of contact, except where tack welding is specifically shown or specified. Grind all exposed welds.

1.05 SUBMITTALS

A. Shop drawings based on the Contract Documents shall be submitted to the Architect for review prior to ordering of materials.

B. Failure by the contractor to submit shop drawings, test reports, etc. required above shall release the Architect and the Engineer from any liabilities due to the negligence on the part of the contractor to comply with the construction documents.

C. Approval will cover size and arrangement of members, character of construction, but not dimensions.

D. Contractor shall verify actual dimensions at the construction site.

E. Manufacturer's data sheets on each product used, including:
1. Preparation instructions & recommendations.
2. Storage and handling requirements & recommendations.
3. Installation methods.

F. Shop Drawings for Stairs:
1. Plan and section of stair installation.
2. Indicate rough opening dimensions for ceiling.

1.06 REFERENCES

A. ANSI A14.9: Safety Requirements for Ceiling Mounted Disappearing Climbing Systems

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store stairway until installation inside under cover in manufacturer's unopened packaging. If stored outside, under a tarp or suitable cover.

1.08 WARRANTY

A. Disappearing Stairways Limited Warranty: One year against defective material and workmanship, covering parts only. Defective parts, as deemed by the manufacturer, will be replaced at no charge, freight excluded, upon inspection at manufacturer's plant.

1.09 MATERIALS

A. Comply with the following standards, as pertinent:
1. Steel plates, shapes, and bars: ASTM A36;
2. Steel plates to be bent or cold-formed: ASTM A283; grade C;
3. Steel tubing (hot-formed, welded, or seamless): ASTM A500; grade B;
4. Steel bars and bar-size shapes: ASTM A306; grade 65, or ASTM A36;
5. Cold-finished steel bars: ASTM A108l
6. Cold-rolled carbon steel sheets: ASTM A336;
7. Galvanized carbon steel sheets: ASTM A526, with G90 zinc coating in accordance with ASTM A525;

8. Stainless steel sheets: AISI type 302 or 304, 24 ga. with number 4 finish;
9. Gray iron castings: ASTM A48, class 10;
10. Malleable iron castings: ASTM A47;
11. Steel pipe: ASTM A53, grade A, schedule 40, black finish unless otherwise noted;
12. Concrete inserts:
    a. Threaded or wedge-type galvanized ferrous castings of malleable iron complying with ASTM A27.
    b. Provide required bolts, shims, and washers, hot-dip galvanized in accordance with ASTM A153.
13. Bolts and nuts: Provide hexagon-head regular type complying with ASTM A307, grade A.
14. Lag bolts: Provide square-head type complying with Fed Spec FF-B-561;
15. Machine screws: Provide cadmium plated steel type complying with Fed Spec FF-S-111.

B. Castings shall be made from the best grade of soft pig iron cast in stove place molding sand to a uniform thickness. Castings shall be free of defects impairing strength or appearance.

C. Accessories: Provide all anchors bolts, anchor straps, hangers and other related fittings, fastener and accessories required for proper and secure installation of all miscellaneous metal. Fasteners for exterior use shall be zinc coated. Generally, the sizes, shapes and spacing of items are shown or specified; where not shown or specified, accessories shall be adequate for the required services, subject to approval.

1.10 ITEMS TO BE PROVIDED

A. Lintel Angles and Bent Plates: Galvanized steel in sizes indicated on Drawings. Extend loose lintel angles 8" on each side of opening.

B. Steel Pipe Guardrails: 1-1/4" Standard galvanized steel pipe with 1/2" x 1/2" bar verticals welded to pipe frame as detailed in Drawings. Hot-dipped galvanized steel at all exterior railings.
1. Except where specifically detailed otherwise, railings in new concrete shall be mounted to cast-in galvanized steel sleeves. Field painted (refer to Division 09 – “High Performance Coatings”).

C. Steel Pipe Hand Railings: 1-1/4" Standard steel pipe fabricated with welded and round smooth connections as illustrated on Drawings or as required. Hot-dipped, galvanized steel pipe at all exterior handrailings, galvanize railings after fabrication. All railings to have closed ends.
1. Where railings do not return to post or to a vertical or horizontal surface, provide domed ends.
2. Except where specifically detailed otherwise, railings in new concrete shall be mounted to cast-in galvanized steel sleeves.
3. Heavy Duty Handrail Brackets: Model 386, as manufactured by Julius Blum & Co. Galvanized at exterior application.
4. Handrail Brackets: 1-1/2” wide x 1/4” thick steel bent plate handrail brackets, galvanized at exterior application.
5. Provide any other attachments to new and existing construction as required to comply with design loading criteria.

D. Expansion Joint Covers: Extruded aluminum anchored to wall, floor and ceiling per manufacturer's instructions. Expansion joint covers shall be as follows, or approved equal:
1. Interior Ceiling to Wall: Balco/Metaline #AC-15.
2. Interior Wall to Wall: Balco/Metaline #GP-10.
3. Interior Floor to Floor: Balco/Metaline #NBS-10.
4. Interior Ceiling to Ceiling: Balco/Metaline #AC-10.

E. Countertop Support Frames: Provide welded steel support frame for wide countertops Section - Architectural Woodwork. Provide steel tube posts located inside adjacent wall framing, with steel tube, channel, or angle horizontal beneath countertop as indicated in Drawings. Steel sizes indicated in Drawings are minimum sizes allowed; provide larger sizes where required to meet performance criteria and delegated design. The depth of the horizontal member must be designed to fit concealed behind the front vertical side of the countertop. Design connection to

floor slab to support indicated loading and to fit within wall framing dimensions. Pre-drill for screw attachment / connection of countertop underlayment as directed by millwork fabricator / installer.without intermediate supports as indicated in Drawings, and as indicated in Division 6,

F. Bench Bracket: 3” x 3” x 1/4” steel tube with mounting bracket. Provide (1) per 3’-0” of bench, to withstand 100 pounds of force per linear foot of bench.

G. Miscellaneous Equipment Supports: Field verify all dimensions and provide miscellaneous steel support structure for wall and ceiling mounted equipment as follows:
   1. For ceiling mounted projector mounts, and locations and items as specifically detailed or other items called for in the Drawings or other Sections requiring miscellaneous steel supports for complete installation.
   2. For large ceiling fans as indicated in Drawings.
   3. Where not specifically detailed, design and provide supports as required for all other equipment to be provided or installed under this contract.
   4. All supports shall comply with requirements of the equipment Manufacturer(s) for support structure and shall provide adequate strength and secure attachment to building structure, braced against lateral movement.

H. Metal Gratings:
   1. Cast Iron Grating at Trench Drains: Re: Division 25 Section – Plumbing and 33 Section - Utilities.
   2. At gratings in walk surfaces, orient grating so that short dimension of openings are perpendicular to the path of travel, and in compliance with Texas Accessibility Standards.

I. Sidewalk Culvert: 3/8" galvanized checker plate sidewalk culvert cover with countersunk screws.

J. Sidewalk Trench Cover & Frame: Standard support frame and bolted down solid checkered top of Gray Iron, Class 35 shall be Neenah Foundry Co., "Light Duty" Series #R-4991 with Type D skid resistant top, or approved equal by Barry Pattern & Foundry, Campbell, or McKinley Iron Works, in sizes as shown on drawings.

K. Pipe Guards:
   1. Fabricate from 1/4" bent steel plate, in shapes as indicated on drawings. Or where not indicated, bent to fit flat against the wall or column at both ends and to fit around pipe with 2 inch clearance between the pipe and pipe guard. Drill each end for two or more 3/4 inch anchor bolts, spaced 24" on center

L. Downspout Protections:
   1. Downspout Protection Guards:
      a. 1/4" Bent steel plate, galvanized, as indicated on drawings.
      b. Galvanized steel pipe, sized to match largest downspout size.

M. Pipe Bollards:
   1. 6" Diameter galvanized schedule 40 steel pipe with concrete fill. Mound concrete at top of bollard to shed water.
      a. Size: 7'-0" in length, recessed 3'-0" below-grade. 4'-0" height above grade, unless otherwise indicated in Drawings.
      b. Paint: Refer to Division 09, Section "Painting". Colors: safety yellow, or as selected by Architect.

N. Pipe Bollard Cover:
   1. Basis of Design: Lincoln Decorative Bollard Cover, provided by Post Guard, 37525 Interchange Dr., Farmington Hills, MI 48335, 1-866-737-8900.
   2. LPDE resin with UV stabilizers.
   3. Color: Black

O. Steel Gate: Tube frame with steel tube horizontals and verticals as detailed on drawings. Provide gate frames with truss rods and 8”x8”x1/4” triangular welded gusset plates at corners on back side of gate. Tap drill where required for cladding and hardware installation.
   1. Hardware: As shown in Drawings, and as specified in Division 32, “Chain Link Fencing and Gates”.
   2. Gate Hardware: As shown in Drawings, and as follows:

a. Hinges: Heavy Duty gate hinges, structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall be offset and permit gate to swing at least 120°. Provide three hinges for each leaf.
b. Latch: Extra Heavy Duty slide bolt latch with keep, lockable with padlock.

3. Cane Bolts: Provide heavy duty cane bolt for each leaf.
4. Perforated Metal Panel: As manufactured by McNichols Co., or approved equal.
   a. Material: 14 gauge Galvanized Steel.
   b. Hole shape and pattern: Slotted, Straight line.
   c. Perf Size: 1 1/2" x 1/4"
   d. Open Area: 68%
   e. Attachment to Gate Frame: Welded.
5. Finish for gate frame and metal panel: 1 coat shop primer for field painting.
6. Pre-drill frame as required for attachment of facing material(s) indicated in Drawings.

P. Miscellaneous Steel Shapes: Channels, angles, plates, tubing, connections and bolts provided where shown and detailed on drawings. Exterior imbed plates, support angles, and other miscellaneous exterior steel shall be hot-dip galvanized.

Q. Metal Ladders:
1. General:
   a. Comply with ANSI A14.3[, except for elevator pit ladders].
   b. For elevator pit ladders, comply with ASME A17.1/CSA B44.
2. Steel Ladders: Fabricate roof access ladders to configurations as indicated on drawings and as follows:
   a. Space side rails 16 inches to 18 inches apart unless otherwise indicated. apart unless otherwise indicated.
   b. Side rails: Continuous, 1/2 by 3 3/8 inch steel flat bars, with eased edges.
   c. Stringers secured to wall by 1/4 inch x 3 inch x 7 inch bent steel plate brackets bolted to wall with 3/8 inch diameter toggle bolts. Brackets secured to wall at 24 inch O.C. turned inward.
   d. Exterior ladders shall be galvanized.
   e. Rungs spaced not over 12 inch apart. Distance from centerline of rungs to walls or obstructions not less than 6 inch. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
   f. Rungs: 3/4-inch diameter solid steel rod rungs shouldered and welded to stringers.
   g. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
      1) Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
         a) Harsco Industrial IKG, a division of Harsco Corporation.
         b) ROSS TECHNOLOGY CORP.
         c) W.S. Molnar Company.
      2) Source Limitations: Obtain nonslip surfaces from single source from single manufacturer.
   h. Ladder Fall Protection System: Fall Protection Standard 29 CFR 1910, including (but not limited to) OSHA 1910.23. BOD Fixed Ladder Fall Protection System 2000 Climb-Rite by SafeRack, 219 Safety Avenue, Andrews SC 29510, 866-761-7225 or approved equal. Provide 2 personal safety harness and all attachment accessories required for complete fall protection system.
   i. Unless otherwise noted prime ladders, including brackets and fasteners, with zinc-rich primer.

R. Eyebolt Rope Anchors at **Training Tower:** Provide forged through-bolt stainless steel, ¾" diameter, **2"** eye dimension, shoulder eyebolt anchors.
1. Lengths: As required for attachment details and conditions indicated.
2. Attachment to W-Flange Beams: Bolt securely through drilled hole in center of beam flange.
3. Attachment to Steel Joists: Coordinate load and detail of supports with joint fabricator.

4. Attachment to CMU wall: Through-bolted through fully grouted CMU cells, with nuts and washers at both sides, refer to detail in Drawings.
5. Provide stainless steel washers and nuts as required for complete installation.

6. Attachment to floor slab: Refer to detail(s) in Drawings.Editor Note

S. Roof Safety Tie Back Anchors: Hot dipped galvanized roof anchor/tieback assembly with complete anchorage system configured for roof structural elements shown, designed by the manufacturer to withstand loading indicated: Anchors engineered and tested to comply with current OSHA regulations and ANSI/IWCA I-14.1 safety standard for fall arrest and suspended maintenance.
1. HSS tube filled with SM-FOM molded urethane insulation.
2. Steel Reinforcement under slab per drawings and as required.
3. Minimum loading requirements:
   a. 5,000 lb. Ultimate load.
   b. 2,000 lb. Test load.
   c. 1,000 lb. allowable load.
4. Locations as indicated on the drawings and coordinated with the owner.
5. Basis of Design: Summit Model: SM-5 as manufactured by Summit Anchor Company, Inc.

T. Manhole Cover and Hinged Solid Lid and Manhole Frame at storage mezzanine (for training purposes): Provide manhole frame and cover for casting into slab with top of manhole frame and cover flush with adjacent floor slab. Manhole cover shall be gasketed and have a latch or bolt-down cover as a safety provision. Manhole frame shall be cast in slab type as approved by Architect to suit conditions. Provide and install 30 inches diameter solid plastic pipe from underside of manhole cover through slab to 2 inch below bottom of steel joists / structure below deck, pipe securely supported and braced from structure below slab as details in Drawings. Provide miscellaneous steel and hardware as required for support and attachment. Grind or sand any welds and sharp edges smooth as required for safe passage through the manhole and 30 inch pipe.
1. Manhole Cover:
   a. Clear Opening: Nominally 30 inches
   b. Lid: Approximately 34” diameter, heavy duty, solid cover, with gasket, either with a latch or countersunk flush bolt down.
   c. Model: **Neenah Foundry Company, R-6461-HH Frame and Lid.**
2. Solid Lid and Manhole Frame:
   a. Clear Opening: 24”x24”
   b. Lid: Type ‘C’ Lid design and Permagrip texture with 1” border with safety arm and Type ‘G’ Handle
   c. Model: Neenah Foundry Company, R-6662-KH Frame and Platen Lid.

U. Metal Ships’ Ladder:
1. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation. Galvanize ships' ladders, including treads, railings, brackets, and fasteners. Construct as
   a. Angle: 50 to 60-degrees from horizontal. Angle must not exceed 60-degrees.
   b. Stringer: C12 x 20.7 steel stringer.
   c. Treads shall be not less than 5 inches (127 mm) exclusive of nosing or less than 8-1/2 inches (216 mm) including the nosing, and riser height shall be not more than 9-1/2 inches (241 mm).
   d. Fabricate ships' ladders, including railings from steel.
   e. Fabricate treads and platforms from Serrated Bar Grate with diamond-pattern front lip. Limit openings in gratings to no more than 1/2 inch (12 mm) in least dimension.
   f. Tread Attachment: Weld treads to stringers, and secure with (2) 1/4 inch round-head bolts each side.

g. Slab Attachment: Attach base plates to slab with 3/8 inch x 5 inch expansion anchors. Provide non-shrink grout between slab and base plate.
h. Ladder Handrail: 1-1/4 inch standard steel pipe, welded to stringer at 4 inches - 0 inches O.C.

2. Galvanize and prime exterior steel ships' ladders, including treads, railings, brackets, and fasteners, with zinc-rich primer.

1.11 SHOP PAINTING

A. All Iron and Steel Work: Unless otherwise specified, power tool clean all surfaces to remove mill scale. Work shall receive a shop coat of paint before leaving the factory or being exposed to the weather. Aluminum work contacting dissimilar metals shall receive a protective coating preventing galvanic action.

B. Shop Paint: Shop paint shall be Fabricator's standard, fast curing, lead free, "universal" primer, compatible with finish paint system indicated and for capability to provide sound foundation for field applied topcoats.

C. Aluminum surfaces to be in direct contact with concrete and masonry shall be shop coated with zinc chromate primer.

PART 2 - EXECUTION

2.01 FABRICATION

A. Contractor shall secure and be responsible for all field measurements required for the proper and accurate fabrication and installation of the items included under this section; field alterations will not be permitted except upon specific authorization of the Architect.

B. All work shall be assembled in the most substantial manner and reinforced where necessary with structural shapes, using concealed screws, bolts or similar fastenings. Make welds of adequate strength and durability, jointing tight, clean and smooth, flush and in true plane with base metals.

C. All screws or rivets shall be countersunk, unless otherwise noted. Provide lock washers for all bolts.

D. All steel to which wood blocking is connected shall be properly punched for anchoring blocking.

E. Exposed steel shapes with marred surfaces shall be ground or draw-filled to a fine grain finish, as approved before applying shop coat of paint.

F. Assembled work shall be completely constructed in the shop, accurately finished and the pieces match-marked for erection. Form exterior joints to exclude water, grind connections in exposed pieces smooth and polish.

G. The Contractor shall do all drilling, cutting, tapping and fitting of work to accommodate other work coming in contact with it, and shall furnish all taps, bolts and other fittings in connection therewith.

H. Except where otherwise noted, fastening to concrete, solid masonry or hollow masonry shall be with expansion bolts or anchors. Fastening to wood plugs will not be permitted. Toggle bolts may be used only when approved by the Architect.

I. Fabrication of Disappearing Stair:
1. Completely fabricate stairway ready for installation before shipment to the site.

2.02 EXAMINATION

A. Disappearing Stair:
1. Do not begin installation until rough opening and structural support have been properly prepared.
2. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
3. Examine materials upon arrival at site. Notify the carrier and manufacturer of any damage.

2.03 INSTALLATION, GENERAL

A. All work included in this Contract shall be installed by the Contractor at the proper time and as rapidly as the progress of the adjacent and connecting work will permit.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true to line, and free of rack; and measured from established lines and levels.

C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Field Welding:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
5. Touch-up shop prime coats.

F. Immediately after erection, clean the field welds, bolted connections, and abraded areas of shop priming. Paint the exposed areas with same material used for shop priming.

G. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

2.04 INSTALLATION, SPECIFIC ITEMS

A. Miscellaneous Framing and Supports:
1. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
2. Anchor supports securely to and rigidly brace from building structure.

B. Metal Pipe Bollards:
1. Anchor bollards in concrete. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard for positive drainage away from bollard base.
2. Fill bollards solidly with concrete, mounding top surface to shed water.
3. Paint bollards color(s) as approved by architect.

C. Steel Gates:
1. Install gates square and plumb. Adjust tension on truss rod as required, after gate cladding is installed.
2. Install with all gate hardware as detailed in Drawings, or where not detailed with same hardware as specified for chain link gates in Division 32.

2.05 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 50 00

SECTION 06-1000 – ROUGH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
1. Rooftop equipment bases and support curbs.
2. Wood blocking, cants and nailers.
3. Wood furring and grounds.
4. Wood sleepers.
5. Plywood.

B. Related Requirements:
1. Division 3 Section “Concrete Formwork.”
2. Division 5 Section “Miscellaneous Metals.”
3. Division 6 “Architectural Woodwork.”
4. Division 8 “Hollow Metal Doors and Frames.”
5. Division 8 “Wood Doors.”
6. Division 8 “Finish Hardware.
7. Division 9 “Paint.”
8. Division 10 “Toilet Accessories.”

1.03 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Timber: Lumber of 5 inches nominal or greater in least dimension.

D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.05 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
1. Dimension lumber framing.
2. Timber.
3. Laminated-veneer lumber.
4. Parallel-strand lumber.
5. Miscellaneous lumber.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

D. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.02 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat all rough carpentry unless otherwise indicated and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.03 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.

For enclosed roof framing, framing in attic spaces, and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by testing agency.

E. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat all rough carpentry unless otherwise indicated, and the following:
   1. Framing for raised platforms.
   2. Framing for stages.
   3. Concealed blocking.
   4. Framing for non-load-bearing partitions.
   5. Framing for non-load-bearing exterior walls.
   6. Roof construction.
   7. Plywood backing panels.

2.04 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions:
   1. Application: Interior partitions not indicated as load-bearing.
   2. Species:
   a. Hem-fir (north); NLGA.
   b. Mixed southern pine; SPIB.
   c. Spruce-pine-fir; NLGA.
   d. Hem-fir; WCLIB, or WWPA.
   e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
   f. Northern species; NLGA.
   g. Eastern softwoods; NeLMA.
   h. Western woods; WCLIB or WWPA.

2.05 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Rooftop equipment bases and support curbs.
   4. Cants.
   5. Furring.
   6. Grounds.
   7. Utility shelving.

B. For items of dimension lumber size, provide Construction or No. 2 and the following species:
   1. Hem-fir (north); NLGA.
   2. Mixed southern pine; SPIB.
   3. Spruce-pine-fir; NLGA.
   4. Hem-fir; WCLIB or WWPA.
   5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
   6. Western woods; WCLIB or WWPA.
   7. Eastern softwoods; NeLMA.

C. For utility shelving, provide lumber with 19 percent maximum moisture content and any of the following species and grades:

1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine.
2. Mixed southern pine; No. 1 grade; SPIB.
3. Spruce-pine-fir (south) or spruce-pine-fir.

D. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
   1. Mixed southern pine; No. 2 grade; SPIB.
   2. Spruce-pine-fir (south) or spruce-pine-fir.
   3. Western woods; Construction or No. 2 Common.

E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.05 PLYWOOD PRODUCTS:

1. All lumber shall be kiln dried to a moisture content of 4-1/2 percent. Kiln dried lumber shall be tempered for not less than four weeks before using.
2. Softwood Plywood for Laminate finish: DOC PS 1, at semi-exposed surfaces unless noted otherwise.

2.06 CONSTRUCTION PANELS

A. Subflooring: PS 2 type, rated Sheathing - as indicated on drawings.
   1. Bond Classification: Exterior.
   2. Span Rating: 48/24.
   3. Performance Category: 3/4 PERF CAT.

B. Roof Sheathing: PS 2 type, Oriented strand board wood structural panel - as indicated on drawings.
   1. Grade: Structural 1 Sheathing.
   2. Bond Classification: Exposure 1.
   3. Performance Category: 5/8 PERF CAT.
   4. Span Rating: 40/20.
   5. Edges: Tongue and groove.
   6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
   7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
   8. Warranty: Manufacturer's standard lifetime limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.
   9. For roof insulation see section 06-1600 Part 2.06.

C. Wall Sheathing: PS 2 type, Oriented strand board wood structural panel.
   1. Bond Classification: Exterior.
   2. Grade: Structural I Sheathing.
   3. Span Rating: 24/0

D. Wall Sheathing, For Shear Walls: Oriented strand board wood structural panel; PS 2.
   1. Grade: Structural 1 Sheathing.
   2. Bond Classification: Exposure 1.
   3. Span Rating: 24/0.

E. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.07 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.
   1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.08 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
   2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.09 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: 5-1/2” x 3/8” closed cell foam and adhesive backed peel and stick membrane, equal to Protecto Wrap (800-759-9727) “Triple Guard Energy Sill Sealer.”

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

F. Fastenings for Wall Supported Items: Provide and install 2 x 8 (minimum) x 1 stud space wood blocking, unless specified otherwise at all stud wall areas receiving grab bars, toilet partitions, wall bumpers and other wall mounted accessories.

G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
   3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
   4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

I. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.
   2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
   3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
   1. Comply with fastener patterns where applicable.
   2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
   3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.02 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.03 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring horizontally and vertically at 24 inches o.c.

C. Furring to Receive Gypsum Board, Plaster Lath: Install 1-by-2-inch nominal- size furring vertically at 16 inches o.c.

3.04 ROUGH HARDWARE

A. Provide bolts, screws, anchors, inserts and fastenings required for proper attachment of carpentry and millwork items. Fastenings to concrete or masonry with expansion bolts or anchors. Toggle bolts may be used for hollow masonry. Fastening to wood plugs not permitted. Fastenings spaced 16" o.c. unless otherwise noted.

3.05 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 06-1753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop-fabricated wood trusses.
B. Truss bridging.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
    1. Include identification of engineering software used for design.
C. Designer's Qualification Statement.

1.03 QUALITY ASSURANCE

A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in State Name.
B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Handle trusses in accordance with SBCA (BCSI).
B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 TRUSSES

A. Wood Trusses: Design and fabricate trusses in accordance with ANSI/TPI 1 and to achieve specified design requirements indicated.
    1. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
        a. Factory mark each piece of lumber with grade stamp of grading agency.
        b. Provide dressed lumber, S4S.
        c. Provide dry lumber with 19 percent maximum moisture content at time of dressing
    2. Connectors: Steel plate.
    3. Structural Design: Comply with applicable code for structural loading criteria.
    4. Roof Deflection: L/240 for Total Load & L/360 for Live Load .

2.02 MATERIALS

A. Lumber:
    1. Moisture Content: Between 7 and 9 percent.
    2. Lumber fabricated from old growth timber is not permitted.
B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G60/Z180 coating; die stamped with integral teeth; thickness as indicated.
C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.03 ACCESSORIES

A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, 19 percent maximum and 7 percent minimum moisture content.

B. Fasteners: Electrogalvanized steel, type to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

A. Install trusses in accordance with manufacturer's instructions, SBCA (BCSI); maintain a copy of applicable documents on site until installation is complete.

B. Set members level and plumb, in correct position.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field-cut or alter structural members without approval of Architect.

E. Install permanent bridging and bracing.

F. Install headers and supports to frame openings required.

G. Frame openings between trusses with lumber in accordance with Section 06-1000.

H. Coordinate placement of decking with work of this section.

3.04 TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 06-4023 – ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. This Section includes the following:
   1. Interior standing and running trim.
   2. Stairwork
   3. Interior ornamental work.
   4. Wood cabinets.
   5. Plastic-laminate cabinets.
   6. Wood countertops.
   7. Plastic solid surfacing material countertops.
   8. Solid surface Quartz countertops.
   9. Closet and utility wood shelving.
   10. Shop finishing of interior woodwork.
B. Related Sections include the following:
   1. Division 05 Section - Metal Fabrications for metal railings, handrail brackets and miscellaneous steel as required to support countertops.
   2. Division 06 Section - Rough Carpentry for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
   3. Division 06 Section - Finish Carpentry for interior carpentry exposed to view that is not specified in this Section.
   4. Division 06 Section **-**Quartz Countertops for manufactured stone countertops.
   5. Division 07 Section - Joint Sealants for sealing around architectural woodwork and countertops.
   6. Division 09 Section - Painting for field finishing of architectural woodwork.
   7. Division 09 Section - Resilient Flooring, Resilient Base and Accessories for rubber base installed at cabinet base boards.
   8. Division 10 Section**[s]** for metal shelving and storage.
   9. Division 11 Section - Residential Appliances for appliances installed in millwork and under countertops.
   10. Division 11 Section - Food Preparation Equipment for stainless steel cabinets and countertops.
   11. Division 12 Sections for manufactured furniture.
   12. Division 22 Sections for plumbing fixtures and fittings.
   13. Division 26 Sections for electrical devices installed in architectural woodwork.

1.03 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

B. Transparent Finish: Wood finish with exposed grain, including both stained and unstained finishes in colors as selected by Architect, with clear or translucent protective finish coat(s).
C. Opaque Finish: Coating finish systems that completely obscure the wood grain.
D. Rough carriages for stairs are a part of interior architectural woodwork. Platform framing, headers, partition framing, and other rough framing associated with stair work are specified in Division 06 Section - Rough Carpentry.

1.04 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.
B. For appliances, equipment, electrical/plumbing fixtures and utilities attached to or adjacent prior to installation of cabinets. to millwork, coordinate required clearances and rough openings, prior to fabrication and
    1. Prior to fabrication of millwork, Contractor to verify that appliance doors, handles, and controls do not conflict with doors and drawers of adjacent millwork, and adjust millwork dimensions or provide filler strips as required to allow full 90° opening of all doors, and full opening of drawers. Coordinate prior to utility rough in where solution involves changing the location of appliances.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories.
    1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
    1. Show details at not less than 1-1/2" scale. Submittal format shall be 30" x 42" sheets.
    2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
    3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets and other items installed in architectural woodwork.
    4. Show arrangement of splashes at countertops.
    5. Apply WI-certified compliance label to first page of Shop Drawings.
C. Samples for Initial Selection:
    1. Shop-applied transparent finishes.
    2. Shop-applied opaque finishes.
    3. Plastic laminates.
    4. PVC edge material.
    5. Thermoset decorative panels.
    6. Solid-surfacing materials.
D. Samples for Verification:
    1. Lumber with or for transparent finish, not less than 5 inches wide by 12 inches long, for each species and cut, finished on 1 side and 1 edge.
    2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
    3. Veneer-faced panel products with or for transparent finish, 8 by 10 inches for each species and cut. Include at least one face-veneer seam and finish as specified.
    4. Lumber and panel products with shop-applied finish, 50 sq. in. for lumber and 6 by 8 inches for panels, for each finish system and color, with 1/2 of exposed surface finished.
    5. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish with 1 sample applied to core material and specified edge material applied to 1 edge per countertop edge profile.

6. Solid-surfacing materials, 6 inches square.
7. Corner pieces as follows:
   a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
   b. Miter joints for standing trim.
8. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.
B. Product Certificates: For each type of product, signed by product manufacturer.
C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.07 QUALITY ASSURANCE

A. Materials and Fabrication, General:
   1. Provide Premium Grade for transparent (stained) finish and Custom Grade for painted finish woodwork, per AWI standards. Casework and Cabinetry shall be of reveal overlay design, unless otherwise specified or indicated on drawings.
   2. Casework shall minimally meet AWI Section 400A standards for transparent finished custom grade casework.
   3. All dimensions, substrates, etc. shall be verified in the field by the Contractor.
   4. Use maximum length material for all trim, base, etc.
   5. Scribe and fit all cabinets and casework tightly to adjoining construction unless otherwise indicated.
B. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
   1. Fabricator shall have had at least 5 years' experience in projects of similar scope.
C. Installer Qualifications: Fabricator of products.
D. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers and transparent-finished wood doors that are required to be of same species as woodwork.
E. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
   1. Provide labels and certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.
F. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.
G. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section - Project Management and Coordination.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
B. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and maintaining relative humidity within typical design operating range for the facility, during the remainder of the construction period.
C. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
    1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.
    2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.10 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
B. For appliances and equipment attached to or adjacent to millwork, coordinate required clearances and rough openings, prior to fabrication and prior to installation of cabinets.
    1. Prior to fabrication of millwork, Contractor to verify that appliance doors, handles, and controls do not conflict with doors and drawers of adjacent millwork, and adjust millwork dimensions or provide filler strips as required to allow full 90° opening of all doors, and full opening of drawers. Coordinate prior to utility rough in where solution involves changing the location of appliances.
C. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 08 Section - Door Hardware (Scheduled by Describing Products) to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

1.11 WARRANTIES

A. Quartz countertop manufacturer's standard 10-year warranty against material defects.

1.12 EXTRA MATERIALS

A. Provide additional shelf brackets for adjustable cabinet shelves, minimum of one additional bracket per cabinet section with adjustable shelves, in manufacturer’s unopened packages.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
B. Certified Wood: Interior architectural woodwork shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
C. Wood Species and Cut for Transparent Finish: **White oak, rift sawn.**
D. Wood Species for Opaque Finish: Any closed-grain hardwood.
E. Wood Products: Comply with the following:
    1. All lumber shall be kiln dried to a moisture content of 4-1/2 percent. Kiln dried lumber shall be tempered for not less than four weeks before using.
    2. Hardboard: AHA A135.4.
        a. Pegboard: Commercial grade tempered hardboard (Masonite) sheet with factory drilled holes at 1” on center each way. Provide 4’x4’ in tool room unless specifically stated to exclude. Painted to match millwork.
    3. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
    4. Particleboard: Use of particleboard core material is prohibited.
    5. Medium Density Overlay Plywood (MDO): APA PS1-09, Exterior Grade B-B, MDO plywood.
    6. Medium Density Fiberboard Combination Core Plywood: Panels constructed of veneer core plywood inner plies with phenolic-bonded MDF crossbands with PureBond® formaldehyde-free technology; Classic Core as manufactured by Columbia Forest Products, or approved equal.
        a. Panels made of particle board, MDF, Plywood, and combination core with lumber core instead of plywood core are not acceptable substitutions for the combination core panels as specified.
    7. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
        a. Use Combination Core panels at doors and drawer fronts and exposed end panels unless otherwise noted.
F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
    1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
    2. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates as scheduled in the drawings or approved comparable product.

G. Float Glass for Cabinet Doors: ASTM C 1036, Type I, Class **1 (clear).** Quality-Q3, 1/4" thick.
H. Tempered Float Glass for Cabinet Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear, 1/4" thick, unless otherwise indicated.
I. Tempered Float Glass for Cabinet Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1 (clear). Quality-Q3; with exposed edges seamed before tempering, 1/4" thick.

2.02 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified.
    1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
    2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.

3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use the following treatment type:
   1. Exterior Type: Organic-resin-based formulation thermally set in wood by kiln drying.
   2. Interior Type A: Low-hygroscopic formulation.
   3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking plant certified by testing and inspecting agency.
   4. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
   5. Kiln-dry materials before and after treatment to levels required for untreated materials.

C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.
   1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
   2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
   3. Product: Subject to compliance with requirements, provide "Duraflake FR" by Weyerhaeuser, or comparable product.

D. Fire-Retardant Fiberboard: Medium-density fiberboard panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

2.03 CABINET HARDWARE AND ACCESSORIES

A. General:
   1. All hardware and accessory materials associated with architectural cabinets provided and installed by cabinet fabricator**.**
   2. Finish for Exposed Cabinet Hardware (Typical unless otherwise noted): Brushed Nickel
   3. Finish for Semi-Exposed and Concealed Cabinet Hardware (Typical unless otherwise noted): Brushed Nickel.
   4. Provide all screws, fasteners, and miscellaneous hardware and attachments as required for complete installation.

B. Hinges:
   1. Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch- thick metal.
      a. Provide hinges designed for thick doors where thick or hollow core doors are detailed in Drawings.
   2. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening soft-closing.
      a. Provide four (4) hinges per leaf at tall cabinet doors.
      b. Provide hinges designed for thick doors, where thick or hollow core doors are detailed in Drawings.

c. At combination core plywood, provide hinges with screws of the optimal length to make best advantage of screw pulling strength of the plywood core, regardless of whether the optimal screw length comes standard with the hinges.

3. Continuous Hinges at tall cabinet doors.
4. Flipper door slide hinge for fold-away doors at bed storage: Equal to Accuride Flipper door slide 123 with Overlay style hinge hardware kit. Provide correct size kit for door dimensions and weight. Provide magnetic door catches.
5. Self Closing Mechanism for upward-acting (toybox type) hinged lids: Box storage units shall have Sugatsune Lapcone heavy-duty soft closing lid mechanism HDS-20-BLK-L x type as required for torque rating.
6. Double-Acting Bar Door Hinge: Heavy Duty, adjustable tension, mortised double-acting spring loaded hinge, equal to McKinney 4007MRB.
7. Scissor Hinge for Sink-Front Panel: Equal to Knape and Vogt SH-1-S/P.
   a. Coordinate with electrical contractor for installation of electrical switch for disposer, to be located behind sink panel inside of cabinet, to the left side of the kitchen sink.
8. Top-mounted book-return flap hinge:

C. Cabinet Pulls:
   1. Bar Pulls: Satin stainless steel bar pulls,[7 inches long, 5 centers, minimum of 3/8 inch in diameter and 1-1/4 inches deep, equal to Swiss Kelly SK-0007.
D. Door and Drawer Locks: Each room of cabinets shall be keyed separately and with master into building system, unless otherwise noted. Verify keying with Owner prior to ordering locks. Provide 2 keys per lock unless otherwise noted.
   1. Disc Tumbler Cam Locks: As manufactured by CompX National, or equal. Cam configuration to suit applications.
   2. Provide heavy duty spring loaded elbow catches at one leaf of each pair of locking double doors, equal to Epco Epc-1018-N.
   3. Key each wardrobe and personal storage cabinet separately and to building master.
E. Catches (At non-locking doors and drawers): No catches (European style hinges hold doors in closed position)
F. Adjustable Shelf Pilasters and Supports in Cabinets: Four Flush-mounted 23 gauge high strength steel, zinc finish pilaster standards adjustable to 1/2" increments, equal to Knape and Vogt Series 244.
   1. Provide an additional surface mounted Pilaster at all shelves wider than 36", at the middle back of shelf, equal to Knape and Vogt Series 233.
   2. Provide longest possible standards to fit full height of cabinets, using manufacturer's standard lengths.
   3. Provide square, self-adhesive felt pads at glass shelves.
   4. Provide all installation hardware, and support brackets equal to Knape and Vogt 237 series, as required for complete installation. Provide additional support brackets as specified in Part 1 of these specifications.
G. Adjustable Shelf Rests (for pre-drilled holes at cabinet side supports):
   1. 1/4" diameter metal flat top shelf rests, equal to Knape and Vogt 331 series. Mortise bottom side of shelves to match shelf rest shape to prevent sliding.
H. Drawer Slides: Zinc-plated steel drawer slides with steel ball bearings and as follows:
   1. Box Drawer Slides (for drawers less than 7" deep): Side mounted; full-extension type; Medium duty, 100 lb rated.
      a. Typical Box Drawer Slides equal to Knape and Vogt 8400 series.
      b. Kitchen/Breakroom: Soft closing slides equal to Fulterer 5001.ECD series.
   2. File Drawer and Deep Storage Drawer Slides: Side mounted full-extension type; Heavy duty ball bearing, 200 lb rated.
      a. Typical File Drawer Slides equal to Knape and Vogt 8800 series.
      b. Kitchen/Breakroom: Soft closing slides equal to Fulterer FR 5210.ECD series.

3. File Drawer Hangers: Hanging file kit for Wood Drawers, consisting of rail supports and metal cut-to-length rails, equal to Blum "Metafile". Provide one file drawer hanger system per file drawer indicated.
4. Trash Bin Slides: Soft Closing pull-out trash slide system with white trash bin equal to:
   a. Knape and Vogt USC 12-1-50-WH for single trash bin units.
   b. Knape and Vogt USC-18-2-50-WH for double trash bin units.
5. Roll-Out Tray / Desk Slide Extension: Medium Duty, 100 lb rated, equal to Knape and Vogt 8407.
6. Cookie Sheet Drawer Slides / System: Equal to Vauth-Sagel K150 Pull-Out Baking Tray and Cookie Sheet Holder Set for face-mounted cabinet face, for use at tall narrow drawer face section between handicap accessible sink and range.

I. Aluminum Slide Assembly for Sliding Glass Doors: Zinc plated steel track with full ball bearing carriers equal to Knape and Vogt "Roll-Ezy Ball Bearing Track", No. P1092 ZC with plunger lock KV No. 984 NP.

J. Flat Screen Monitor Arm: Countertop grommet-hole mounted, adjustable monitor support arm with wire management grommet. Equal to Doug Mockett and Co. FSA4/G-23.

K. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
   1. Product: Subject to compliance with requirements, provide "TG series" by Doug Mockett & Company, Inc.

L. Trash Chute Ring: Stainless Steel, 12" round x 3" trash chute ring for installation in countertops, as manufactured by Doug Mockett & Company, or equal. (Finish interior edge of countertop cut-out to match countertop, for cleanable surface).

M. Coat Rod: Heavy Duty 1-1/4" round, chrome finish, metal rod with similar finish and material escutcheons at each end with countersunk holes for attachment to inside of cabinet. Installed with U-shape brackets on one or both sides as required to allow rods to be removed and replaced.
   1. At handicap accessible wardrobe cabinets, provide a second set of brackets. Install the rod and both sets of brackets with U-shape bracket on one or both sides as required so that the rod may be removed and installed at either height without removing brackets. Provide one such extra set of brackets at 5% of all wardrobe lockers in the fire fighter bed rooms.
   2. Provide rod below paint grade fixed wood shelf where rod and shelf is indicated in closets.

N. Coat Hooks:
   1. Coat and hat double hook for mounting in wardrobe cabinets: Equal to Ives 572.
      a. Provide 1 in each locker unless noted otherwise.

O. Mail Sorter Slots:
   1. Provide black vinyl snap-on edge protection u-channel caps with nominal 1/2" face and return legs. Adhesively apply edge protection full width of shelves on both sides. Provide with 1/2" x 6" clear, self-adhesive label holders install on edge protection channels, at both sides of built-in hardboard mail slots. Label holders equal to Holdex L21GR. Provide 5% extra of installed quantity of label holders.

P. Cabinet Signage:
   1. Provide one stainless steel number plate for each wardrobe cabinet door in hallways. Reference Division 10, Section - Signage for additional requirements.

Q. Adjustable Storage Shelving on Standards:
   1. Single slotted heavy duty standards and brackets with anochrome finish shall be Knape and Vogt No. E83 and E183, or approved equal.
   2. Shelves shall be 3/4" painted hardwood plywood unless otherwise noted.
   3. Attach shelves to brackets with screws.

R. Cantilever Countertop support brackets: Provide brackets as manufactured by A & M Hardware, or approved equal:

1. Concealed cantilever brackets: **2”** wide, style **“C”**, sized to countertop depth(s) as indicated in Drawings.
2. Surface mounted cantilever brackets: Equal to A&M Hardware 1/8” steel “Workstation Brackets”, sized to shelf or countertop depth(s) as indicated in Drawings.
3. Color: black.

S. Silencers: 1/16" flat top clear rubber, self-adhesive pads. Install two per cabinet drawer or door.

2.04 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
B. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
    1. Conceal all anchors, or otherwise locate as indicated in Drawings and approved by Architect.
D. Handrail Brackets: Refer to Division 5, Section - Metal Fabrications.
E. Adhesives, General: Adhesives shall not contain urea formaldehyde.
F. Low-Emitting Materials: Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
G. VOC Limits for Installation Adhesives: Installation adhesives shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    1. Wood Glues: 30 g/L.
    2. Multipurpose Construction Adhesives: 70 g/L.
    3. Contact Adhesive: 250 g/L.

2.05 LOUVERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    1. Air Louvers Inc.
    2. L & L Louvers, Inc.
B. Metal Louvers:
    1. Blade Type: Vision-proof, inverted V.
    2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, with baked-enamel or powder-coated finish.
    3. Width: Provide custom width to match millwork door thickness.

2.06 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom -grade interior woodwork complying with referenced quality standard.
B. Solid Stock Standing and Running Trim
    1. Species for Transparent Finish: Match species and grain of adjacent panels for transparent finish unless otherwise indicated.
    2. Species for Opaque Finish: Any closed grain hardwood.
    3. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.

C. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
D. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
E. Cabinet Construction
    1. Face Frames: Not less than 3/4" x 1-5/8" solid lumber rails and stiles with glued mortise and tenon joints.
    2. Exposed Ends: Not less than 3/4" thick combination core plywood, connected to stile with pressure-glued tongue and plow joint and supplemented by special fasteners.
        a. Ends at openings below countertops without adjacent base cabinet: 4” wide panel with 3/4" thick MDF (or 3/4" combination core MDF/plywood if screws are attached) on each side, and ¾” cap at exposed end. Finished to match adjacent millwork. 4” dimension is to assist in rubber base wrapping around without puckering.
        b. Provide finished backs, sides, and similar surfaces to match other exposed faces wherever exposed in the final work, and whether or not these exposed conditions are specifically indicated in the Drawings. Modify typical details as may be required to provide finished back, side and other panels that are not exposed in the typical conditions for each piece of millwork. Panel construction of such exposed panels shall be not less than that for other exposed panels.
    3. Semi-Exposed Panel Ends: Not less than 3/4" thick combination core plywood.
    4. Unexposed Ends: Not less than 1/2" thick plywood attached to front frame in same manner as exposed ends.
    5. Door and Drawer Faces: 3/4" thick combination core plywood.
    6. Back, Top and Bottom Rails: Not less than 3/4" x 3" solid lumber machined to interlock with end panels, and grooved to receive top and bottom panels with back rails secured under pressure with glue and fastening devices.
    7. Shelving: Not less than 3/4" thick hardwood plywood with lumber core banded on front with 3/4" x 1-1/4" hardwood.
    8. Bottoms: Not less than 3/4" thick plywood fully supported into gains in end panels and grooves in front frame and back bottom rails.
    9. Back Panels: Not less than 1/4" thick, 5-ply veneer core plywood, glued and fastened to machined rear edge of end panels and to top and bottom rails.
        a. At exposed back panels, provide panels equal to those for exposed end panels and exposed surfaces shall match adjacent cabinet body finish.
    10. Toe Boards: Not less than 3/8" attached between end panels and extended from bottom panel to floor.
    11. Corner Blocks: Wood blocks glued and fastened in each of four top corners to maintain cabinet squareness and rigidity.
    12. Casework Doors: 3/4 inch thick hardwood veneer combination core plywood with 1/4" hardwood banded edges.At full height cabinet doors (larger than standard base cabinets), use 1" thick combination core.
    13. Top of Cabinet Finishes:
        a. Tops of cabinets other than those above are considered semi-exposed surfaces.
            1) For stained wood veneer cabinets, semi-exposed tops shall be sanded smooth and sealed with 2 coats clear sealer.
F. Drawer Construction
    1. Drawer Body: Not less than 1/2" solid hardwood sub-front, back and sides, fully dovetailed and glued at all four corners with fronts fastened to sub-front with mounting screws from interior of body.
    2. Drawer Bottoms: Not less than 1/4" thick 5-ply veneer core plywood glued into and fully supported by grooves in all four sides of drawer body.
G. Wall cabinets

1. Valances: Provide continuous valance across each run of cabinets, with minimum number of joints required in each run. Locate joints to be hidden with doors in closed position.
    a. Set valance back slightly from face of cabinet frame to avoid contact with doors.
    b. Unless otherwise indicated, provide nominal 2" valance measured from top side of the bottom shelf to bottom of valance at typical cabinets and nominal 3" valance where below cabinet lighting is indicated.
2. Doors: Fabricate doors to extend to 1/8" below bottom of valances, to allow for adjustment and hide the sight line of valances with doors in closed position.
3. Exposed side panels: Extend down to match bottom of valance.
4. Finishes at Tops and Bottoms:
    a. Exposed Finishes: Bottoms of cabinets 5'-9" and higher, and tops of cabinets 5'-9" and lower, above floor level are considered exposed surfaces to receive finish matching other exposed surfaces.
    b. Semi-Exposed Surfaces: Bottoms of cabinets 2'-0" to 5'-9" above floor level and tops of cabinets 5'-9" or higher above floor level are considered semi-exposed surfaces
        1) At stained wood veneer cabinets, sand smooth and seal.
    c. Exposed finishes are also acceptable as long as consistently applied within any room or space.

H. Ventilation and Louvers: Provide ventilation for Audio Visual (A/V) equipment cabinets in Dayroom, Fitness Room, and any other locations as indicated in Drawings. Coordinate with A/V and other equipment installers as applicable for open area required for ventilation and any other requirements.
1. Provide intake air through the bottom panel of the cabinet, outside of the base at the toe kick. Provide slots in the base panel 1-1/2" to 2" wide, with edge banded interior faces of the cut-outs. Do not make any one slot long enough to compromise the strength of the base panel to the extent that the panel may crush in the middle.
2. Where A/V or other equipment installer will provide an exhaust fan with trim kit, coordinate cutout size with A/V installer, located high on the side panel of the cabinet.
3. Where A/V or other equipment installer will not provide an exhaust fan, and where high exhaust is through the cabinet door, provide a stained hardwood louver in the door face, of size to provide acceptable ventilation to equipment installer.
    a. Species and color: To match flush wood doors, or other color as approved by Architect through finish sample submittals.

I. Exposed surfaces shall be machine-sanded to an even, smooth surface, nails set, ready for finishing. All woodwork shall be dry, clean and smooth before any finishing materials are applied. All nail holes, cuts, cracks and other defects shall be treated so as to render them unnoticeable.

J. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.

K. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment. Verify cabinet doors and drawers operate freely at inside cabinet corners.

L. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
   1. Seal edges of openings in countertops with a coat of varnish.
   2. Coordinate with actual appliances and equipment to be mounted to cabinets and under countertops, whether such equipment is provided by Contractor or by Owner, and verify unobstructed operation of equipment and of cabinet doors and drawers.

M. Countertops and Splashes:
   1. Units fabricated and designed to with-stand a 200 lb. per sq. ft. loading condition without the use of vertical supports. Fabricator shall indicate on shop drawings any special locations for stud supports as required for attachment of countertops.
   2. Provide welded steel tube support frames to support countertops at wide spans between base cabinets, walls, or other countertop supports. Conceal steel tubes in adjacent wall, countertop, and cabinet construction to maximum extent possible unless specifically detailed otherwise. Refer to Division 5, Section - Metal Fabrications for general requirements. Provide steel supports as follows:
      a. Where specifically detailed in Drawings.
      b. Where required to achieve loading criteria specified.
   3. Junction between countertops and non-integral splashes caulked with clear silicone sealant providing a tight sanitary joint. Junction between splash, countertop or any casework and wall shall be caulked with silicone sealant of color to match wall or adjacent construction.
   4. Splash of same construction and countertop, to dimensions indicated on drawings. Provide side splashes at all walls and tall cabinets adjacent to countertops.

N. Install glass to comply with applicable requirements in Division 08 Section - Glazing and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.07 WOOD CABINETS FOR TRANSPARENT FINISH

A. Grade: Custom.
B. AWI Type of Cabinet Construction: As indicated.
C. Reveal Dimension: As indicated in Drawings.
D. Matching of Veneer Leaves: Book match.
E. Exposed Surfaces: Do not juxtapose materials noticeably dissimilar in color, grain, figure and natural color markings. Exposed portions of cabinets include all surfaces, including edges, visible when doors and drawers are closed. Visible surfaces in open cabinets and shelving units are also to be considered exposed surfaces. Provide materials as indicated below:
   1. Doors and Drawer Fronts: 3/4" Panels of Hardwood Veneer on Combination Core Plywood, with hardwood banded edges.
   2. Other Panel Surfaces: Hardwood veneer plywood.
   3. Solid Stock: Match panel species and grain.

F. Semi-exposed Surfaces: Transparent wood finish materials selected to eliminate appearance defects of any species of hardwood or softwood with color and grain characteristics similar to exposed portions. Semi-exposed portions of cabinets include surfaces behind opaque doors and drawer fronts including shelves, dividers, interior faces of cabinet ends, backs, tops and bottoms, drawer sides, backs and bottoms. Also, included are underside bottoms of cabinets over 2'-0" from floor and tops 5'-9" or more above floor. Provide surface materials indicated below:
   1. Surfaces Other Than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.
   2. Drawer Sides and Backs: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
   3. Drawer Bottoms: Hardwood plywood.

G. Concealed Members: Solid Lumber. Concealed portions of cabinets include sleepers, web frames, dust panels and other surfaces not normally visible after installation.

2.08 PLASTIC-LAMINATE CABINETS

A. Grade: Custom.
B. AWI Type of Cabinet Construction: As indicated.
C. Reveal Dimension: As indicated in Drawings.
D. Panel Products for Exposed Surfaces:
   1. Doors and Drawer Fronts: Combination Core.
   2. Other Surfaces: Medium Density Fiberboard, unless otherwise indicated.
E. Laminate Cladding for Exposed Surfaces: Exposed portions of cabinets include all surfaces, including edges, visible when doors and drawers are closed. Visible surfaces in open cabinets and shelving units are also to be considered exposed surfaces. All exposed surfaces to receive high-pressure decorative laminate complying with laminate grade requirements of the specified cabinet grade.
   1. Tops of cabinets visible from a mezzanine or floor level above are considered exposed surfaces.
F. Materials for Semi-exposed Surfaces: Semi-exposed portions of cabinets include surfaces behind opaque doors and drawer fronts including shelves, dividers, interior faces of cabinet ends, backs, tops and bottoms, and drawer sides, backs and bottoms. Also, included are underside bottoms of cabinets over 2'-0" from floor and tops 5'-9" or more above floor.
   1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate.
      a. Edges of Plastic-Laminate Shelves: Edge banding, matching laminate in color, pattern, and finish.
      b. At surfaces with screw attachment for hinges, use plywood or combination core plywood unless otherwise noted or approved by Architect.
   2. Drawer Sides and Backs: Solid-hardwood lumber.
   3. Drawer Bottoms: **Hardwood plywood.**
G. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: Provide melamine balancing sheet.
H. Laminate Colors, Patterns, and Finishes: As scheduled in Drawings.

2.09 SOLID-SURFACING-MATERIAL COUNTERTOPS

A. See Specification Section 06 61 19 “Quartz and Solid Surface Countertops and Fabrications.”

2.10 QUARTZ SOLID SURFACE COUNTERTOPS

A. See Specification Section 06 61 19 “Quartz and Solid Surface Countertops and Fabrications.”

2.11 CLOSET AND UTILITY SHELVING

A. Shelf Material: 3/4-inch hardwood veneer-faced plywood with solid-lumber edge, for transparent finish.

2.12 TOOL PEGBOARDS

A. Tool-Hanging Pegboards:
   1. Provide Masonite pegboard in Shop in size as indicated in Drawings, or if not indicated, 4’x4’ sheet.
   2. Install with plastic spacers and with galvanized fasteners and washers, of appropriate type for substrate indicated. Fasten through corner holes and at 2’ on center around the perimeter.
   3. Finish: Unpainted
   4. Hanging Accessories: Not in contract, provided and installed separately by Owner.

2.13 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.
B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
C. General: Shop finish transparent-finished interior architectural woodwork at fabrication shop as specified in this Section. Refer to Division 09 painting Sections for finishing opaque-finished architectural woodwork.
D. Finishing Materials: Products shall comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
E. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
    1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with balancing sheet.
F. Transparent Finish:
    1. Wash Coat for Stained Finish: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
    2. Staining: See Finish Schedule. If not noted, Color as Selected by Architect.
    3. AWI Finish System: Conversion varnish.
    4. Sheen: Semi-gloss, 46-60 gloss units measured on 60-degree gloss meter per ASTM D 523.
G. Opaque Finish: All woodwork to have paint finish shall be primed at the shop with one coat of approved primer paint, compatible with finish system specified. Refer to Division 9, Section - Painting for field painting of interior woodwork.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate fully with work of related trades for piping, conduit, outlets, switches, plumbing fixtures, equipment, appliances, and other items installed into or adjacent to millwork cabinets, as required to avoid conflicts. Contractor shall make adjustments to millwork or other construction, at no additional cost to Owner, that may be required due to Contractor’s failure to coordinate between trades.

3.02 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing materials and backpriming.

3.03 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.
F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Where exposed fastening is unavoidable, use fine finishing nails, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
    1. At trim for transparent finish, fill gaps, if any, between wall and exposed edges of trim and base boards with plastic wood filler, sand smooth, and finish same as wood.
    2. At trim for opaque finish, neatly caulk gaps, if any, between trim and wall and paint to match adjacent finish.
    3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
H. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
    1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
    2. Maintain veneer sequence matching of cabinets with transparent finish.
    3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
I. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
    1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
    2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
    3. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
    4. Caulk space between backsplash and wall with sealant specified in Division 07 Section - Joint Sealants.
J. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
K. Refer to Division 09 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.04 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
B. Clean, lubricate, and adjust hardware.
C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 06-6140 – QUARTZ AND SOLID SURFACE COUNTERTOPS AND FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Quartz countertops.
   2. Quartz fabrications.
   3. Solid Surface Countertops.
   4. Setting materials and accessories.
B. Related Sections:
   1. Division 06 Section - Rough Carpentry.
   2. Division 06 Section - Architectural Woodwork.
   3. Division 07 Section - Joint sealers.
   4. Division 09 Section - Gypsum Board.

1.03 REFERENCES

A. American National Standards Institute (ANSI):
   1. A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.
   2. A118.4 - Latex-Portland Cement Mortar.
B. ASTM International (ASTM:
   1. C97 - Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
   2. C99 - Standard Test Method for Modulus of Rupture of Dimension Stone.
   3. C170 - Standard Test Method for Compressive Strength of Dimension Stone.
   4. C241 - Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic.
   5. C482 - Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.
   6. C484 - Standard Test Method for Thermal Shock Resistance of Glazed Ceramic Tile.
   7. C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
   8. C648 - Standard Test Method for Breaking Strength of Ceramic Tile.
   9. C650 - Standard Test Method for Resistance of Ceramic Tile to Chemical Substances.
   10. C672/C672M - Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals.
   11. C880 - Standard Test Method for Flexural Strength of Dimension Stone.
   12. C1026 - Standard Test Method for Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling.
   13. C1028 - Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.
   14. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.04 QUALITY ASSURANCE

A. Fabricator and Installer Qualifications: Minimum 2 years documented experience in work of this Section.

1.05 SUBMITTALS

A. Shop Drawings: Include countertop layout, dimensions, materials, finishes, cutouts, and attachments.
B. Samples:
   1. Manufacturer's standard size quartz samples in specified color.
   2. Standard sealant colors for selection by architect.

1.06 WARRANTY

A. Provide manufacturer's 10 year warranty against defects in materials and workmanship.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Quartz Sheet:
   1. Product: As scheduled on Drawings, or approved equal.
   2. Composition: Quartz aggregate, resin, and color pigments formed into flat slabs.
   3. Color: To be selected by Architect from manufacturer's full color range, or as indicated on drawings.
   4. Thickness: ¾ nominal.
   5. Physical characteristics:
      a. Static coefficient of friction: 1.02 dry, 0.51 wet, tested to ASTM C1028.
      b. Water absorption: Maximum 0.03 percent, tested to ASTM C97.
      c. Compressive strength: Minimum 29,000 psi, tested to ASTM C170.
      d. Bond strength: Minimum 210 psi, tested to ASTM C482.
      e. Modulus of rupture: Minimum 6300 psi, tested to ASTM C99.
      f. Flexural strength: Minimum 5800 psi, tested to ASTM C880.
      g. Breaking strength: Minimum 480 lbf, tested to ASTM C648.
      h. Stain resistance: Not affected by 10 percent hydrochloric acid or 10 percent KOH, tested to ASTM C650.
      i. Thermal shock resistance: Pass 5 cycles, tested to ASTM C484.
      j. Abrasive index: 65-Ha = 25, tested to ASTM C241.
      k. Thermal expansion: 1.670 x 10^{-5} in/in/deg F, tested to ASTM C531.
      l. Deicing resistance: Rating of 0, tested to ASTM C672/C672M.
      m. Freeze/thaw resistance: 0 tiles at 15 cycles, tested to ASTM C1026.
      n. Flame spread rating: Class 1, tested to ASTM E84.

2.02 SOLID-SURFACING-MATERIAL COUNTERTOPS

A. Solid-Surfacing-Material Thickness: 3/4 inch, with 3/4" splashes.
B. Wood Underlayment Material (where required for support by surface material):
   1. Core Material at countertops: Particleboard or medium-density fiberboard.
   2. Core Material at countertops with sinks: Exterior-grade MDO plywood or Marine-grade MDO plywood.
   3. Use fire retardant treated material at fire retardant treated cabinets.
C. Colors, Patterns, and Finishes: As indicated in Drawings.
D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
   1. Fabricate tops with shop-applied edges of materials and configuration indicated in Drawings.

2. Fabricate tops with shop-applied backsplashes.

2.03 ACCESSORIES

A. Adhesive: Type recommended by quartz manufacturer.
B. Joint Sealer:
   1. Latisil Tile and Stone Sealant by Laticrete® International, Inc.
   2. Color: To be selected by Architect from manufacturer's full color range.

2.04 FABRICATION

A. Cut quartz panels accurately to required shapes and dimensions.
B. Micro-chamfer exposed edges.
C. Fabricate with hairline joints. Minimize joint lines.
D. Cut holes for sinks faucets.
E. Edge Style: micro-chamfer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive countertops; remove loose and foreign matter that could interfere with adhesion.

3.02 INSTALLATION

A. Install countertops in accordance with manufacturer's instructions and approved Shop Drawings.
B. Adhere countertops to supports with continuous beads of adhesive.
C. Set plumb and level. Align adjacent pieces in same plane.
D. Install with hairline joints.
E. Fill joints between countertops and adjacent construction with joint sealer; finish smooth and flush.

3.03 INSTALLATION TOLERANCES

A. Maximum variation from level and plumb: 1/8 inch in 10 feet, non-cumulative.
B. Maximum variation in plane between adjacent pieces at joint: Plus or minus 1/16 inch.

3.04 CLEANING

A. Clean countertops in accordance with manufacturer's instructions.

3.05 PROTECTION

A. Protect installed countertops with non-staining sheet coverings.

END OF SECTION 06 61 40

SECTION 07-1113 – BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:

1. Cold-applied, emulsified-asphalt dampproofing.

a. At masonry backup for veneer masonry cavity walls.

b. At grade beams below grade, with drainage course to french drain.

c. At retaining walls, with free draining aggregate and french drain.

B. Related Sections include the following:

1. Division 04 Section - Unit Masonry Assemblies.
2. Division 07 Section Self Adhering Sheet Waterproofing, for waterproofing system at building grade beams and walls below grade.
3. Division 07 Sections for other waterproofing, air barrier, and weather barrier systems.
4. Division 07 Section - Sheet Metal Flashing and Trim.
5. Division 31 and 33 Sections for filter fabric, free draining aggregate and french drains.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.04 FIELD CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide protection course molded-sheet drainage panels and auxiliary materials recommended in writing by manufacturer of primary materials.
B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.02 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. BASF Construction Chemicals - Building Systems; Sonneborn Brand Products.
   2. ChemMasters, Inc.
   3. Euclid Chemical Company (The); an RPM company.
   4. Henry Company.
   5. Karnak Corporation.
   6. Koppers Inc.
   7. Malarkey Roofing Products.
   8. Meadows, W. R., Inc.
B. Basis of Design shall be a heavy bodied, non-sag coating with short fibers for application with Fibered Brush, Roller or Spray, in compliance with ASTM D-1227, Type II, Class 1, equal to BASF's "MasterSeal 615".

2.03 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
D. Patching Compound: Asbestos-free fibered mastic of type recommended in writing by dampproofing manufacturer.
E. Protection Course at grade beams below grade: ASTM D 6506, 1/8-inch- thick, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.
F. Protection Course at retaining walls: Smooth-surfaced roll roofing complying with ASTM D 6380, Class S, Type III.

2.04 MOLDED-SHEET DRAINAGE PANELS

A. Molded-Sheet Drainage Panel: Comply with Division 33 Section - Subdrainage.
B. Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a 40% post-industrial recycled polypropylene drainage core of fused, entangled filaments, with a geocomposite fabric facing bonded to one side with an opening size not exceeding No. 70 sieve, and a vertical flow rate of 9 to 22 gpm per ft. Provide termination bar and sheet metal flashing cap for panels installed with top edge above grade. The Basis of Design product shall be "Enkadrain 3611R", as manufactured by Colband Inc., Enka, NC (800) 365-7391.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.
B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.
C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

3.03 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
    1. Apply dampproofing to provide continuous plane of protection.
    2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
B. Where dampproofing footings and foundation walls, apply from finished-grade line to bottom of grade beam
    1. At footings, extend over top of footing and down a minimum of 6 inches over outside face of footing.
    2. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
    3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1 inch onto flashing, and 1/4 inch onto masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
    1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
    2. Lap dampproofing at least 1/2 inch onto shelf angles supporting veneer.
    3. At metal flashings installed with termination bar to exterior face of masonry, strip in bituminous felts. Lap felts at least 2" over metal flashing and continuously seal top of felt strip to masonry with dampproofing.
D. Where dampproofing of cavity walls adjoins other dampproofing or air barrier or weather barrier materials, coordinate with adjacent material installer to provide continuous weatherproofing barrier and to avoid incompatible materials coming in contact with each other. Take care not to apply or spill dampproofing on surfaces to receive incompatible weatherization membranes.

3.04 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Concrete Foundations: Apply one fibered brush or spray coat at not less than 3 gal./100 sq. ft. or one trowel coat at not less than 4 gal./100 sq. ft.
B. Unexposed Face of Masonry Retaining Walls: Apply primer as recommended by manufacturer for substrates indicated, and one brush or spray coat at not less than 1.25 gal./100 sq. ft.
C. Concrete and Masonry Backup for Veneer Assemblies: Apply primer as recommended by manufacturer for substrates indicated, and one brush or spray coat at not less than 1 gal./100 sq. ft.

3.05 INSTALLATION OF PROTECTION COURSE

A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
    1. Install protection course within 24 hours of installation of dampproofing (while coating is tacky) to ensure adhesion.

3.06 INSTALLATION OF MOLDED-SHEET DRAINAGE PANELS

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate dampproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
    1. Install protection course before installing drainage panels.
B. Where indicated to extend above grade, install top edge of drainage panel with mechanically attached termination bar and prefinished sheet metal flashing cap.

3.07 CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 07 11 13

SECTION 07-1326 – SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Modified bituminous sheet waterproofing.
B. Related Sections include the following:
   1. Division 07 Sections for coordination with other waterproofing, air barrier, and weather barrier systems.
   2. Division 07 Section - Sheet Metal Flashing and Trim.
   3. Division 07 Section - Expansion Control for expansion-joint assemblies that interface with self adhering sheet waterproofing.
   4. Division 31 and 33 Sections for filter fabric, free draining aggregate and french drains.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
   2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.
B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.
B. Pre-Construction Mockups: Build free standing pre-construction mockup **[s]** to verify selections made under Sample submittals, demonstrate understanding of the complete wall construction, demonstrate typical construction and waterproofing details, demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Build mockup [s] as shown on drawings, including face and backup wythes, fenestrations, flashings and accessories.. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.
      a. Prior to product installation a field-constructed mock-up shall be provided under the provisions of Division 1 Section - Submittals, Product Data, Samples and Mock-ups, to verify details & tie-ins, and to demonstrate the required quality of materials and installation.
      b. Construct a typical exterior wall section, incorporating back-up wall, cladding, window and sill, insulation, flashing and any other critical junctions (roof, foundation, etc.) as detailed in Drawings..
      c. Locate mockups as directed by Architect.
      d. Build mockups as indicated in Drawings.

1) Show typical components, attachments to building structure, and methods of installation.
e. Obtain Architect's approval of mockups before starting installation.
f. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
g. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
2. Demolish and remove mockups when directed.

C. Building Sample: Build construction sample to verify selections made under Sample submittals and to set quality standards for installation.
1. Build for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatment, corner treatment, and protection.
a. Size: 100 sq. ft. in area.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.05 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.02 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side.
1. Products: Basis of Design product is "Bituthene 4000", as manufactured by W. R. Grace, Cambridge, MA (800) 444-6459. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
b. CETCO Building Materials Group, a subsidiary of AMCOL International Corp.; Envirosheet.
c. Henry Company; Blueskin WP 100/200.
d. Meadows, W. R., Inc.; SealTight Mel-Rol.
e. Polyguard Products, Inc.; Polyguard 650.
f. Protecto Wrap Company; PW 100/60.
g. Tamko Building Products, Inc.; TW-60.
2. Physical Properties:
a. Tensile Strength, Membrane: 250 psi minimum; ASTM D 412, Die C, modified.
b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.

e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
g. Water Vapor Permeance: 0.05 perms maximum; ASTM E 96/E 96M, Water Method.
h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.

3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.03 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
   1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
   1. Primer: Liquid primer recommended for substrate by sheet-waterproofing material manufacturer, promoting adhesion of Bituthene membrane, equal to Bituthene Primer B2.
C. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.
D. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.
E. 4" PVC pipe (perforated).
F. Filter fabric.
G. Termination Bar: Provide flat extended 1" aluminum termination bar, with Rubber grommetted fasteners, at 8" o.c. to terminate top of waterproofing membrane. Equal to Tru-Fast TB-90.

2.04 MOLDED-SHEET DRAINAGE PANELS

A. Molded-Sheet Drainage Panel: Comply with Division 33 Section - Subdrainage.
B. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate of 9 to 15 gpm per ft., equal to Grace Construction Hydroduct 220. Provide termination bars and sheet metal flashing cap for panels installed with top edge above grade.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.
   1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
   2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
    1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.
F. Bridge and cover isolation joints and expansion joints with overlapping sheet strips of widths according to manufacturer's written instructions.
G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
    1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
        a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.03 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.
B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.
    1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.
    2. Extend sheet at least 4" above grade, minimum.
D. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.
E. Seal edges of sheet-waterproofing terminations with mastic.
F. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing, air barrier, and weather barrier systems. Install over perforated drain pipe at base of beam or wall. Coordinate with other systems to ensure continuous weather proof barrier with no incompatible materials in contact with each other.
G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

3.04 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels the same day as installing sheet waterproofing membrane, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
B. Where indicated to extend above grade, install top edge of drainage panel with mechanically attached termination bar and prefinished sheet metal flashing cap, in colors as selected by Architect to match adjacent wall finishes.

3.05 FIELD QUALITY CONTROL

A. Owner will engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish daily reports to Architect.

3.06 PROTECTION, REPAIR, AND CLEANING

A. Protect waterproofing from damage and wear during remainder of construction period.
B. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 13 26

SECTION 07-2100 – THERMAL INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide all building insulation as shown on the drawings and as herein specified.
B. Med Related Sections include the following:
   1. Division 04 Section – Masonry sections, for coordination in marking centerlines of studs on the face of exterior continuous insulation for subsequent installation of ties and anchors.
   2. Division 04 Section - Unit Masonry Assemblies, for loose fill insulation in CMU cells.
   3. Division 06 Section - Sheathing.
   4. Division 07 Section - Sprayed Foam Thermal Insulation.
   5. Division 07 Section - Air Barriers.
   6. Division 07 Section - Fire Safing, for mineral fiber insulation used for fire containment or for fire rated construction.
   7. Division 09 Section - Gypsum Board Assemblies.
   8. Division 09 Section - Acoustic Insulation.
   9. Division 21 and 23 Sections, for piping and mechanical ductwork insulation.

1.03 QUALITY ASSURANCE

A. Design Criteria:
   1. Thermal Resistance: R-Value designations indicated in accordance with ASTM C-518 is the thermal resistance of the insulation only.
   2. Fire Resistance: Material shall have a Class B fire rating less than 75 as tested by ASTM E-84.
B. Paper faced batt insulation shall not be used. Foil-faced insulation shall not be used except as specifically prescribed herein.
C. Contractor to provide third-party post-installation inspections and reports before cover-up of all wall, ceiling and under slab insulation. Report shall document, with images and verbiage, installation. Report shall also note where insulation does not adhere to manufacturer’s installation instructions or due to installation does not meet required R-values as noted in the drawings. As a part of the report, corrective action shall be provided for proper installation, and prior to cover-up a follow-up report verifying corrective action had been performed shall be provided.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original packages, clearly marked with brand name, type and R-Value.

B. Store materials in area protected from weather, moisture and damage, remove any damaged materials from the site.

1.05 SUBMITTALS

A. Samples of materials and complete product literature (with documented R-Values) submitted for approval to the Architect prior to ordering materials.
B. Provide Dew Point Analysis to confirm insulation thickness and location of weather barrier for particular building site (inside or outside face of insulation).

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with project requirements, Manufacturer's offering Products which may be incorporated into the work include the following:
   1. CertainTeed Corporation, Valley Forge, PA. (215) 341-7000.
   2. Owens-Corning Fiberglass Corporation, Toledo, OH. (419) 248-8000.
   3. Schuller International, Insulation Division, Denver, CO. (800) 654-3103.
   4. Johns Manville, Denver, CO.
   5. Knauf Insulation, Shelbyville, IN.
   6. Dow Chemical Company, Midland, MI.
   7. ROXUL, Inc., Milton, Ontario
B. Division 01 Section - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.02 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

A. Extruded Polystyrene Rigid Insulation at Foundation walls and slabs: Closed Cell Extruded Polystyrene Board Insulation.
   1. Rigid Insulation at Foundation: 2", R-10 Closed cell polystyrene.
   2. Rigid Insulation at heated floors: 1", R-5 Closed cell polystyrene.
   3. Basis of Design Product - Owens Corning Foamular 250 Extruded Polystyrene XPS, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. DiversiFoam Products.
      b. Dow Chemical Company (The).
      c. MBCI.
      d. Owens Corning.
   4. Flame-Spread Index: Not more than 10 when tested in accordance with ASTM E84.
   5. Smoke-Developed Index: Not more than 175 when tested in accordance with ASTM E84.

2.03 MINERAL-WOOL BLANKET INSULATION

A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type IA (blankets without membrane facing) for use in stud framed wall conditions and above lay-in acoustical ceiling systems; consisting of fibers; passing ASTM E136 for combustion characteristics.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Johns Manville; a Berkshire Hathaway company.
      b. Rockwool International.
      c. Thermafiber, Inc.; an Owens Corning company.
   2. Applications - Interior and Exterior stud walls.
   3. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
   4. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.

5. Provide at 6 inches stud construction in exterior walls and between conditioned and unconditioned spaces, unless otherwise noted: Nominal 6 inches thick batt insulation with a minimum R-value of 19.
6. Provide at 3-5/8 inch stud construction in exterior walls and between conditioned and unconditioned spaces, unless otherwise noted: Nominal 3-1/2 inch thick batt insulation with a minimum R-value of 13.
7. Post-consumer plus 1/2 pre-consumer recycled content by weight not less than 70 percent. Binder with no added formaldehyde. Insulation shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Owens Corning / Thermafiber "UltraBatt", or equal.
8. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.

2.04 MINERAL-WOOL BOARD INSULATION

A. Mineral-Wool Board Insulation: Continuous Insulation "ci" at exterior cavity wall Construction, and between Apparatus Bay and conditioned spaces: Semi-rigid mineral wool insulation board that is water repellent and meets ASTM C612, IVA. Thermafiber RainBarrier 45 Insulation, or approved equal.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Johns Manville; a Berkshire Hathaway company.
      b. Rockwool International.
      c. Thermafiber, Inc.; an Owens Corning company.
   2. Applications - ci insulation for exterior masonry or stone cavity walls.
   3. R-Value: 4.3 per inch of thickness. Thickness(es) as noted on Drawings.
   4. Facing: Unfaced.
   5. Density: 4.5 pounds per cubic foot.
   6. Surface Burning Characteristics: Flame Spread 0, Smoke Developed 0.
   7. Moisture Resistance: Absorbs less than 0.03 percent by volume, ASTM C 1104.
   8. Non-Corrosive, ASTM C 665.
   9. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches (305 mm) and wider in width.
   10. **Reference Specification Section 07 48 00 Façade Attachment System for additional information and framing for façade material at insulation.**

2.05 ROOF INSULATION

A. Refer to specification section 06-1600 Sheathing.

2.06 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates. Adhesive shall be compatible with air barrier membrane.
B. Provide insulation fasteners as recommended by manufacturer for substrates and conditions indicated.
C. Insulation Netting: For batt insulation below roof or floor deck, provide insulation netting equal to Economy 1”x 2” Mesh by ADO Insulation Products, 13220 Wilfred Lane North, Suite 100, Rogers, MN 55374 – 800-666-8191, installed per manufacturer’s recommendations.

PART 3 - EXECUTION

3.01 INSPECTION AND COORDINATION

A. Examine areas receiving insulation work to insure work of preceding trades is completed. Check surfaces to see that they are uniform in place, free from mortar droppings, grease, oil or other debris which would affect proper insulation. Application constitutes acceptance of substrate conditions.
B. Coordinate marking centerline of studs on exterior face of continuous insulation as required for insulation installation and for subsequent fastener installation by other trades.

3.02 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.
B. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
C. Prepare surfaces using methods recommended by manufacturer for achieving the best result for the substrate under the project conditions.
D. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
E. Install insulation with manufacturer's R-value label exposed after insulation is installed.
F. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
G. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Fit insulation tight within spaces and tight to and behind mechanical and electrical wiring Remove projections that interfere with placement.
H. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.
I. Install batt insulation without visible voids, gaps or separations. Place insulation in Cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members. Cut and trim insulation neatly to fit spaces without laps, bulges or folds. Use batts free of rips and tears.
    1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
    2. Coordinate with light gauge metal stud installer to pack batt insulation in light gauge metal construction as it is being constructed, that will be inaccessible to install batts when completed (headers, stud packs, etc).
    3. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
    4. Fill roof expansion joints with batt insulation to equal or greater R-value of insulation at roof surface.
J. Mineral Fiber Semi-Rigid Board Continuous Insulation:
    1. Continuous insulation at exterior walls shall be adhered or attached in place per manufacturer's recommendations for the substrates and conditions indicated. Use of friction fit only between furring channels is not an acceptable installation.
        a. Construction adhesive must be recommended by its manufacturer for use with the continuous insulation board and compatible with air barrier membrane or dampproofing mastic with which it will come in contact.
        b. Mechanical fasteners installation shall be coordinated with air barrier manufacturer's requirements for fastener penetrations through the air barrier, as applicable.
    2. Fit courses of insulation with edges butted tightly in both directions. Press units firmly against substrates indicated.

3. Press units firmly against sheathing, or other substrates. Stagger joints. Make insulation continuous. Fill all voids.
4. Coordinate placement of insulation with location of masonry veneer anchors, metal Zee furring, and similar construction.
5. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

K. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.03 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.04 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions.
2. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
3. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
4. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
5. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.05 INSTALLATION OF CAVITY-WALL INSULATION

A. Mineral-Wool Board Insulation: Install insulation fasteners 4 inches (100 mm) from each corner of board insulation, at center of board, and as recommended by manufacturer.
1. Fit courses of insulation between masonry wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
2. Press units firmly against inside substrates.

3.06 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
   5. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
   6. For wood-framed construction, install blankets according to ASTM C1320 and as follows:
      a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
   7. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
      a. Exterior Walls: Set units with facing placed toward as indicated on Drawings.
      b. Interior Walls: Set units with facing placed as toward areas of high humidity

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
   2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.07 FIELD QUALITY CONTROL

A. Comply with requirements of Authorities having jurisdiction for inspection of installation of insulation, and with requirements of commissioning agent. Notify respective parties and schedule required inspections prior to closing walls or cavities containing thermal insulation.

B. Comply with requirements of Division 01, Section "Construction Waste Management".

3.08 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07-2600 – VAPOR BARRIER MEMBRANE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section includes:
   1. Vapor barrier film beneath slabs on grade and slabs on void forms.
B. Related Sections:
   1. Division 03 Section - Cast-in-Place Concrete.
   2. Division 31 Section - Earthwork.

1.03 COORDINATION

A. Coordinate installation with scheduled concrete pours to avoid delays. Make provision for installation of work by other trades.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E 1745-17 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
   2. ASTM E 154- 08 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
   3. ASTM F 1249-06 (2011) Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
   4. ASTM D 882-10 Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
   5. ASTM D 1709-09 Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
   6. ASTM E 1643-18a Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
B. American Concrete Institute (ACI):
   1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.05 SUBMITTALS

A. Division 01 Section - Submittal Procedures: Procedures for submittals.
B. Quality Control / Assurance:
   1. Summary of test results as per paragraph 8.3 of ASTM E 1745.
   2. Manufacturer’s literature.
   3. Manufacturer’s installation instructions for placement, seaming and penetration repair.
C. Provide 12" x 12" samples of vapor barrier material and samples of tape for joints.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
   1. Basis of Design: Stego Industries LLC (281) 367-0040 www.stegoindustries.com.
   2. Raven Industries (800) 635-3456 www.ravenefd.com.
   3. Reef Industries (713) 507-4250 www.reefindustries.com.

B. Division 01 Section - Product Requirements: Product options and substitutions. Substitutions: Not Permitted

2.02 MATERIALS

A. Membrane Film:
   1. Qualities:
      a. Maintain a permeance of less than 0.01 Perms [grains/(ft^2 · hr · inHg)], as tested in accordance ASTM E-154, with mandatory conditioning tests, per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
      b. Strength: ASTM E 1745 Class A.
      c. Thickness: 15mils minimum, in accordance with ACI 302.2R-06.
      d. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.
   2. Available products:
      a. Basis of Design: Stego Wrap Vapor Barrier (15 mil) by Stego Industries.
      b. Vapor Block (15 mil) by Raven Industries.
      c. VaporGuard (15 mil) by Reef Industries.
      d. No Substitutions.
   3. At crawl space application, use manufacturer's minimum 15 mil thickness crawl space rated product.

B. Accessories:
   1. Seams Tape: Stego Tape by Stego Industries LLC, or membrane manufacturer's standard tape for applications indicated.
   2. Penetration Repair: Stego Mastic and Stego Tape by Stego Industries LLC, or membrane manufacturer's standard product for applications indicated.
   3. Perimeter / Edge Seal: Crete Claw, Stego Tack Tape and Stego Term Bar by Stego Industries LLC, or membrane manufacturer's standard product for applications indicated.
   4. For crawl space installation, use pins, adhesives, double sided mounting tape, termination bars, and caulking as recommended by membrane manufacturer for the applications indicated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Do not proceed until fill is level and without voids, and plumbing and electrical rough-ins are complete.

3.02 INSTALLATION - GENERAL

A. Install Vapor Barrier in accordance with ASTM E 1643-11:
   1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.

2. Extend vapor barrier over footings and grade beams to a distance acceptable to the structural engineer or stop at impediments such as dowels and waterstops.
3. Seal vapor barrier to slab perimeter/edge using Stego Crete Claw and remove dirt, debris, and mud from Crete Claw prior to concrete placement.
4. Alternate: Seal vapor barrier to footing/grade beam with double sided tape, termination bar, or both.
5. Overlap joints 6 inches and seal with manufacturer's tape.
6. Apply tape/Crete Claw to a clean and dry vapor barrier.
7. Seal all penetrations (including pipes) per manufacturer's instructions.
8. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
9. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.

B. Vapor Barrier over void boxes:
1. Cartons for slabs shall have protective cover board with Stego 15 mil and Stego Crete-Claw Tape.
2. Stego Crete-Claw Tape Instructions: Overlap seams a minimum of 6 inches. Seal all seams in Stego Wrap using Crete-Claw Tape.
3. Install Crete-Claw Tape on the entire perimeter of the Stego Wrap Installation.
4. Install additional Crete-Claw Tape if required.

3.03 PROTECTION

A. Protect completed membrane from damage. Prior to pouring concrete, inspect membrane for punctures or damage and repair as required.
1. At crawl space applications, inspect membrane for damage prior to substantial completion. Repair damaged areas per membrane manufacturer's instructions.

END OF SECTION 07 26 00

SECTION 07-2713 – MODIFIED BITUMINOUS SHEET AIR BARRIERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. The work of this section includes, but is not limited to, the following:
    1. Materials and installation methods for self-adhering, vapor-retarding, modified bituminous sheet air barriers located in the non-accessible part of the wall applied to the following surfaces:
        a. Exterior face of exterior sheathing of masonry veneer cavity walls in locations above adjacent roof surfaces and as shown in Drawings.
        b. Exterior face of exterior sheathing of exterior fiber cement walls in locations above adjacent roof surfaces and as shown in Drawings.
        c. Flashing membranes for sealing adjacent air and weather barrier systems, as required to provide a continuous weather-tight installation.
B. Related Sections include the following:
    1. Division 04 Section - Unit Masonry" for embedded flashings and masonry ties and anchors.
    2. Division 06 Section - Rough Carpentry.
    3. Division 06 Section - Sheathing.
    4. Division 07 Section - Building Insulation for foam-plastic board insulation.
    5. Division 07 Section - Flashing and Sheet Metal for sheet metal flashings.
    6. Division 07 Section - Joint Sealants for joint-sealant materials and installation.
    7. Division 09 Section - Gypsum Board Assemblies for exterior gypsum sheathing.

1.03 DEFINITIONS

A. ABAA: Air Barrier Association of America.
B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.04 PERFORMANCE REQUIREMENTS

A. General: Provide an air and vapor barrier system to perform as a continuous vapor-retarding air barrier, and to act as a liquid water drainage plane flashed to discharge any incidental condensation or water penetration. Air barriers shall be capable of accommodating substrate movement and sealing of substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
B. Air Barrier Assembly Air Leakage: Not to exceed 0.004 cfm/ft2 under a pressure differential of 0.3 in. water. (1.57 psf.) (equal to 0.02L/s/m2 @ 75 Pa.).
C. Temperature: Provide “High Temperature” (HT) rated product.

1.05 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and substrate preparation recommendations for each applicable substrate.
B. Shop drawings showing locations and extent of air and vapor barrier system including details for terminations flashings, penetrations, window and door openings and treatment of substrate joints and cracks.
   1. Include details of interfaces with other materials that form part of the complete building air barrier or weather barrier system.
C. Written documentation demonstrating installers' qualifications under the "Quality Assurance" article including reference projects of a similar scope.
D. Samples: Submit representative samples of the following for approval:
   1. Self-Adhered Air Barrier Membrane
   2. Self-Adhered Transition Membrane

1.06 INFORMATIONAL SUBMITTALS

A. Written documentation demonstrating installers' qualifications under the "Quality Assurance" article including reference projects of a similar scope.
B. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with air barrier; signed by product manufacturer.
C. Warranty: Submit a sample Warranty identifying the terms and conditions.

1.07 QUALITY ASSURANCE

A. Manufacturer: Air and vapor barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of waterproofing and air barrier products. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.
B. Installer: The installer shall demonstrate qualifications to perform the work of this Section by submitting the following:
   1. List of at least three (3) projects contracted within the past five (5) years of similar scope and complexity to this project carried out by the firm and site supervisor.
   2. Installer must show evidence of adequate equipment and trained field personnel to successfully complete the project in a timely manner.
C. Materials: Self-adhered air and vapor barrier material shall be 40 mil (.004 in) comprising 36 mil (.0036 in.) rubberized asphalt integrally bonded to 4 mil (.0004 in.) cross-laminated polyethylene film, rated for high temperature installation (HT). For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.
D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include but not be limited to the following:
   1. Review of submittals.
   2. Review of surface preparation, minimum curing period and installation procedures.
   3. Review of special details and flashings, including connection details with other air and weather barrier systems.
   4. Sequence of construction, responsibilities and schedule for subsequent operations.
   5. Review of mock-up requirements.
   6. Review of inspection, testing, protection and repair procedures.
E. Mock-up:
   1. Prior to installation of the air and vapor barrier system a field-constructed mock-up shall be provided under the provisions of Division 1 Section - Submittals, Product Data,

Samples and Mock-ups, to verify details & tie-ins, and to demonstrate the required quality of materials and installation.

2. Construct a typical exterior wall section, 8 feet long and 8 feet wide, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing and any other critical junction (roof, foundation, etc).
3. Allow 24 hours for inspection and testing of mock-up before proceeding with air and vapor barrier work.
4. Approved mock-up may remain as part of the work, if it is exposed to UV rays less than 30 days.

F. Inspection and Testing: Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed air and vapor barrier membrane until it has been inspected, tested and approved.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
B. Do not double-stack pallets of membrane components. Provide cover on top and all sides, allowing for adequate ventilation.
C. Protect membrane components from freezing and extreme heat.
D. Sequence deliveries to avoid delays, but minimize on-site storage.

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer. Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist. Barrier must be covered with exterior material within 30 days of installation or be replaced.

B. Coordinate air barrier installation to avoid excessive exposure to ultraviolet rays and other damage. Barrier must be covered with exterior material or protected in accordance with Manufacturer's requirements within Manufacturer's exposure time limitations or be replaced.

PART 2 - PRODUCTS

2.01 SELF-ADHERED AIR BARRIER MEMBRANE

A. Description: Min. 1 mm (.040 in) thick membrane comprised of 0.9 mm (0.036 in) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (.004 in) of cross-laminated, high-density polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
B. Minimum Performance Requirements:

Property	Test Method	Typical Value
Thickness	ASTM D 3767 Method A	1.0 mm (0.040 in.) nominal
Air Permeance at 75Pa (0.3 in.	ASTM E 2178	<0.001 L/(s.m^2)

water) Differential Pressure		(<0.0002 cfm/ft^2)
Assembly Air Permeance at 75Pa (0.3 in. water) Differential Pressure	ASTM E 2357	<0.004 L/s*m^2 (<0.0008 cfm/ft^2)
Water Vapor Permeance	ASTM E 96, Method B	Less than 2.9 ng/Pa.s.m^2 (0.05 Perms)
Water Absorption: -	ASTM D 570	Max. 0.1% by weight
Puncture Resistance	ASTM E 154	178 N (40 lbs.)
Tear Resistance	Initiation - ASTM D 1004 Propagation - ASTM D1938	Min. 58 N (7.0 lbs.) M.D. Min. 40 N (4.0 lbs.) M.D.
Lap Adhesion at -4°C (25°F)	ASTM D 1876	880 N/m (5.0 lbs./in.) of width
Low Temperature Flexibility	ASTM D 1970	Unaffected to -43°C (-45°F)
Tensile Strength	ASTM D 412, Die C Modified	Min. 2.7 MPa (400 psi)
Elongation, Ultimate Failure of Rubberized Asphalt	ASTM D 412 - Die C	Min. 200%

C. Air barrier applied to wall at veneer cavity at all walls above adjacent lower roofs: Basis of Design Product: Grace Construction Products: Perm-A-Barrier® High Temperature (HT) Wall Membrane. Subject to compliance with requirements, provide the named product, or approved equal system by another manufacturer.
   1. For In-Service Temperatures up to at least 180 degree F, including accessories.
D. Substitutions: Permitted, with proof of equal performance characteristics. Submit comparison data for basis of design and proposed alternate products, and manufacturer's certification of equal performance characteristics.

2.02 TRANSITION MEMBRANE

A. Description: Min. 1 mm (.040 in / 40 mil) thick membrane comprised of 0.9 mm (0.036 in) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (.004 in) of cross-laminated, high-density polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
B. Performance Requirements:
   1. Water Vapor Transmission: ASTM E 96, Method B: 2.9 ng/m2sPa (0.05 perms) max.
   2. Air Permeance at 75Pa (0.3 in. water) pressure difference: 0.0006 L/(s.m^2) (0.00012 cfm/ft^2) max.
   3. Puncture Resistance: ASTM E 154: 178 N (40 lbs.) min.

4. Lap Adhesion at -4°C (25°F), ASTM D 1876: 880 N/m (5.0 lbs./in.) of width min.
5. Low Temperature Flexibility, ASTM D 1970: Unaffected to -43°C (-45°F).
6. Tensile Strength, ASTM D 412, Die C Modified: min. 2.7 MPa (400 psi)
7. Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D 412 Die C: min. 200%

C. Materials:
   1. Perm-A-Barrier High Temperature Detail Membrane manufactured by Grace Construction Products, or approved equal by other approved air barrier manufacturer.
      a. In-Service Temperature Range: Meet or exceed the requirements for self-adhered membrane.

2.03 AIR & VAPOR BARRIER ACCESSORIES

A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier membrane. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
B. Termination Bar: Air barrier manufacturer's recommended termination bar for applications indicated.
C. Joint Reinforcing Strip: Air barrier manufacturer's glass-fiber-mesh tape.
D. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
E. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Division 07 Section - Joint Sealants.
F. Primer: Water-based primer which imparts an aggressive, high tack finish on the treated substrate
   1. Flash Point: No flash to boiling point
   2. Solvent Type: Water
   3. VOC Content: Not to exceed 10 g/l
   4. Application Temperature: -4°C (25°F) and above
   5. Freezing point (as packaged): -7°C (21°F)
   6. Product: Perm-A-Barrier WB Primer manufactured by Grace Construction Products, or equal by other approved air barrier manufacturer.
G. Sealant: Two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/l max. VOC Content.
   1. Product: Bituthene® Liquid Membrane manufactured by Grace Construction Products, or equal by other approved air barrier manufacturer.
H. Optional Primers:
   1. Description: High tack water based primer. 10 g/l max. VOC content.
      a. Product: Perm-A-Barrier Liquid Part B manufactured by Grace Construction Products, or equal by other approved air barrier manufacturer.
   2. Description: High tack low VOC solvent based primer. <200 g/l max. VOC content.
      a. Product: Bituthene Primer B2 LVC manufactured by Grace Construction Products, or equal by other approved air barrier manufacturer.
   3. Description: High tack solvent based primer. 440 g/l max. VOC content.
      a. Product: Bituthene Primer B2 manufactured by Grace Construction Products, or equal by other approved air barrier manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
C. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
    1. Fill and treat joints according to membrane manufacturer's recommendations for each substrate indicated, and per manufacturer's recommendations to prevent excessive outward building pressures from being exerted on the membrane.
    2. Install modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.
    3. Prime substrates according to membrane manufacturer's requirements for each substrate material indicated.
D. Bridge and cover isolation joints, expansion joints, and discontinuous deck-to-wall and deck-to-deck joints with overlapping modified bituminous strips.
E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
F. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.
G. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws in accordance with exterior sheathing manufacturer's written instructions.

3.03 INSTALLATION

A. Refer to membrane manufacturer’s literature for recommendations on installation
B. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.
C. Application of Self-Adhered Air Barrier Membrane
    1. Install air & vapor barrier to dry surfaces at air and surface temperatures of 40°F and above in accordance with manufacturer's recommendations, at locations indicated on Construction Documents.
    2. Prime substrate to receive air barrier membrane as required per manufacturers written instructions.
    3. Precut pieces of air & vapor barrier into easily handled lengths.
    4. Remove silicone-coated release paper and position membrane carefully before placing length horizontally against the surface.
    5. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
    6. When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
    7. Overlap horizontally adjacent pieces 50 mm (2 in.) and roll seams.
    8. Subsequent sheets of membrane applied above shall be positioned immediately below masonry reinforcement or ties. Bottom edge shall be slit to fit around reinforcing wires or ties, and membrane shall overlap the membrane sheet below by 50 mm (2 in.). Roll firmly into place.
    9. Seal around masonry reinforcing or ties and all penetrations with termination mastic.
    10. Continue the membrane into all openings in the wall, such as doors, windows, etc., and terminate at points that will prevent visibility from interior.

11. Coordinate the installation of air & vapor barrier with roof installer to ensure continuity of membrane with rooftop air & vapor membrane.
12. At end of each working day seal top edge of air & vapor barrier to substrate with termination mastic.
13. Do not allow the rubberized asphalt surface of the air & vapor barrier membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.
14. Do not expose air & vapor barrier membrane to sunlight for more than thirty days prior to enclosure.
15. Inspect installation prior to enclosing and repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 150 mm (6 in.) in all directions from the perimeter of the affected area.

D. Application of Transition Membrane
1. Prime substrate to receive transition membrane as required per manufacturers written instructions.
2. Apply transition membrane with a minimum overlap of 75mm (3 in.) onto each surface at all beams, columns and joints as indicated in detail drawings.
3. Tie in to window and door frames, spandrel panels, roof and floor intersections and changes in substrate.
4. Use pre-cut, easily handled lengths for each location.
5. Remove silicone-coated release paper and position membrane flashing carefully before placing it against the surface.
6. When properly positioned, place against surface by pressing firmly into place by hand roller.
7. Overlap adjacent pieces 50 mm (2 in.) and roll all seams with a hand roller.
8. Seal top edge of flashing with termination mastic.
9. When transition flashing is pre-installed prior to application of Fluid Applied Membrane, apply transition flashing as above. Spray or trowel a continuous uniform film of Fluid Membrane at min. 60 mils (1.5 mm or .060 in.) dry film thickness using multiple, overlapping passes, with a minimum overlap of 75 mm (3 in.) onto transition flashing. For sill condition, spray or trowel Fluid Membrane onto pre-installed sill flashing and onto horizontal section of sill.

E. Termination Bars: Install termination bars as applicable according to manufacturer's recommendations. Install termination bars where recommended by the manufacturer, and where specifically detailed in the Drawings.

3.04 PROTECTION AND CLEANING

A. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by the manufacturer of affected construction.
B. Protect the air barrier from damage and wear during remainder of construction period. Repair damage according to manufacturer's instructions.
C. Wall Membranes are not suitable for permanent exposure and should be protected from the effects of sunlight. Maximum sun exposure is limited to 30 days. Schedule work to ensure that the Wall Membrane system is covered as soon as possible after installation. Protect the Wall Membrane system from damage during subsequent operations. If the Wall Membrane system cannot be covered within 30 days after installation, apply temporary UV protection such as dark plastic sheet or tarpaulins.

END OF SECTION 07 27 13

SECTION 07-2719 – PLASTIC FILM AIR BARRIER

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Air and moisture barrier building wrap, at brick veneer cavity wall and where detailed in drawings.
   2. It is the intent of these specifications that the weatherization system be continuous and sealed to adjacent weatherization systems, roof deck, and other adjacent construction, as required to prevent air leakage around joints, penetrations, and the perimeter of the air barrier system.
B. Related Sections include the following:
   1. Division 04 Sections, for coordination of membrane flashing tape type to be used at masonry ties and anchors.
   2. Division 05 Section - Light Gauge Metal Framing.
   3. Division 07 Section - Bituminous Damp-Proofing.
   4. Division 07, other “Air Barrier” or “Weather Barrier” Sections, for coordination of materials and details at junctures of different weatherization systems.
   5. Division 07 Section - Self Adhering Sheet Damp-Proofing.
   6. Division 09 Section - Stucco Plaster.

1.03 PERFORMANCE REQUIREMENTS

A. ASTM E 1677, Type I air retarder; with flame-spread and smoke-developed indexes of less than 25 and 450 respectively, when tested in accordance with ASTM E 84.
B. ASTM D882; Test method for tensile properties of thin plastic sheeting.
C. Water Vapor Permeance: Not less than 350 g/sq. m in 24 hours (20 perms) per ASTM E 96.

1.04 SUBMITTALS

A. Product Data for each type of product specified.
   1. Submit manufacturer’s standard product literature.
B. Quality Assurance/Control Submittals:
   1. Certificates: Manufacturer's certificate or test data that Products meet or exceed specified requirements.
   2. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.
   3. Submit manufacturer’s written installation instructions.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience.
2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience.

B. Source Limitations: Provide all commercial grade materials. Provide all materials from a single manufacturer, or as recommended by the air barrier manufacturer for use with their system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label.
B. Store and protect materials during construction keeping dry and away from open flame or sparks in compliance with manufacturer's recommendations.

1.07 SCHEDULING AND COORDINATION

A. Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.
B. Schedule installation of air-barrier materials and exterior cladding within nine months of weather barrier assembly installation, or manufacturer's requirement, whichever is more stringent.
C. Coordinate with other air barrier and waterproofing systems specified. Provide membrane flashing and other joint materials as required for compatible joint conditions with adjacent systems, and to provide a continuous weatherization system.
D. Coordinate with decking installation to ensure foam, rubber, or other type closures as may be required by other Sections are installed where such installation is required by sequencing to be installed prior to covering with air barrier system. Where this air barrier system extends to underside of deck, it shall be sealed to deck using membrane flashing, sealant, or other material acceptable to the air barrier system manufacturer.
E. Coordinate requirements for penetrations of masonry and other finish systems. At masonry ties, provide flashing membrane tape under the work of this section unless confirmed that another flashing membrane provided under Division 04 is acceptable. Refer to Division 04, Section “Unit Masonry Assemblies”.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include, but are not limited to the following:
1. DuPont Tyvek Stucco Wrap, for use behind EIFS and portland-cement based plaster systems.
2. DuPont Tyvek Drain Wrap, for use behind wood or cement siding cladding systems.
3. DuPont Tyvek Commercial Wrap - D, for use with above claddings above 4 stories, for enhanced drainage behind cladding systems.
4. DuPont Tyvek Commercial Wrap, for use behind brick-veneer masonry, metal, stone, or synthetic stone veneer cladding systems.

2.02 ACCESSORIES

A. Seam Tape: Minimum 3 inch wide, pressure sensitive tape with approved adhesive, as recommended by the air-moisture barrier manufacturer for commercial applications.

B. Building Wrap Fasteners: Plastic disk fastener-caps with screws, of type and spacing as approved by weather barrier manufacturer for application to substrate. No staples allowed.
C. Building Wrap Sealants: Acrylic or polyurethane sealant as approved by air-barrier manufacturer for applications indicated. Refer to Division 07 Section - Sealants for compliance with exterior-grade sealants.
D. Adhesives: Use only adhesives recommended by weather barrier manufacturer.
E. Primers: Provide primer to assist in adhesion between substrate and flashing, as recommended by flashing manufacturer.
F. Membrane Flashings: Provide self-adhering membrane flashings as indicated in Part 3 of these specifications, and as recommended by air-barrier manufacturer for applicable flashing conditions, opening types, and masonry veneer ties and anchors.
    1. Basis of Design Products:
        a. Flashing for flashing straight edges where membrane does not need to warp or turn corners: Tyvek “Straightflash”.
        b. Flexible Flashing for all other conditions: Tyvek “Flexwrap”.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required by manufacturer, dry, free of loose materials, and ready to receive air-barrier installation.
B. General Contractor shall coordinate sequencing of all flashings installation and verify that flashings required to be installed prior to air barrier installation are installed per requirements of the contract documents.
C. By beginning installation, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 PREPARATION

A. Remove existing air and weather barriers, flashings, carrier or protective films and similar materials that would impede adhesion from substrates indicated to receive elasticized flexible flashing tape. Clean surfaces thoroughly prior to installation in compliance with air-barrier manufacturer's recommendations.

3.03 INSTALLATION

A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
B. Install air barrier sheets and assembly materials to form a seal with adjacent construction and to maintain a continuous air barrier.
    1. Seals to adjacent materials are not acceptable to be installed using seam tape. Seam tape is for seaming the air barrier membrane to itself only. Use membrane flashing tapes, sealants or other appropriate materials according to the Air Barrier system Manufacturer’s written instructions.
    2. Junctures with other air barrier or weatherization systems shall be coordinated to provide a continuous weatherization system across the joint. Contractor shall confirm acceptable details for installation with both weatherization systems in each case. (In most cases, this involves installing a continuous strip of membrane flashing tape at the juncture of the two systems to provide a seal and to separate chemically incompatible materials).

C. Connect and seal building sheet air barrier membrane continuously to exterior window and door openings, construction transitions and other penetrations in exterior wall openings using self-adhering flexible flashing.
   1. Apply self-adhering flexible flashing so that a minimum of 3 inches of coverage is achieved over adjacent substrates.
D. Openings and Penetrations: Provide straight and flexible flashings for openings as required to provide weather-tight barrier. Where indicated by Manufacturer's installation instructions, apply compatible sealants to seal air barrier to penetrations. All penetrations shall be sealed impervious to free flow of air.
E. Install lapped components to direct water to exterior of building.
   1. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.
F. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten all fish-mouths and blisters. Patch with air barrier sheet extending 6 inches beyond repaired areas in all directions shingled in proper lapped condition to direct water to exterior cavity.
G. Correct deficiencies in or remove air barrier membrane that does not comply with requirements; repair substrates and reapply air barrier components.
H. Install weather barrier prior to installation of windows and doors.
I. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.
J. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.
K. Window and Door Openings: Except for openings taller than the width of a roll of air barrier, generally extend weather barrier completely over openings and seam tape, prior to cutting and preparing openings to receive membrane flashing application as specified in paragraphs below.
L. Overlap weather barrier according to Manufacturer's installation instructions and the following:
   1. Exterior corners: minimum 12 inches.
   2. Seams: minimum 6 inches.
M. Weather Barrier Attachment:
   1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners of type indicated, space 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.
N. Apply membrane flashing to weather barrier membrane as recommended by manufacturer prior to the installation of cladding anchors.
O. Seal face of wall to storefront jamb with flashing membrane. Turn to exterior and lap 3".

3.04 SEAMING

A. General: Seam tape is for sealing the air barrier membrane to itself at seams, and not for sealing to adjacent materials, flashing, window and louver openings, etc. Do not use seam tape as a substitute for membrane flashing tape in any application. Use membrane flashing tape and not seam tape for repairs where so required by manufacturer's installation instructions.
B. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.
C. Seal any tears or cuts.

3.05 OPENING PREPARATION (FOR USE WITH NON-FLANGED WINDOWS, DOOR AND LOUVER FRAMES)

A. Flush cut weather barrier at edge of sheathing around full perimeter of opening.

B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.06 FLASHING (FOR USE WITH NON-FLANGED WINDOWS)

A. Cut sill flashing membrane a minimum of 12 inches longer than width of sill rough opening. Apply primer as required by manufacturer.
B. Cover horizontal sill by aligning sill flashing membrane edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
C. Fan sill flashing membrane at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.
D. Apply 9-inch wide strips of flashing membrane at jambs. Align flashing membrane with interior edge of jamb framing. Start flashing membrane at head of opening and lap sill flashing membrane down to the sill.
    1. Where there is a metal sill pan or subsill flashing, extend the jamb membrane flashing into the pan, ensuring there are no discontinuities in the membrane flashing. Where a discontinuity is unavailable, seal with an additional strip of flexible membrane flashing, or with a fluid applied flashing if approved by Manufacturer for use with their air barrier system.
E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.
F. Install sill flashing membrane at opening head using same installation procedures used at sill. Overlap jamb flashing membrane a minimum of 2 inches.
G. Coordinate flashing with window, door, and louver installation.
H. On exterior, install backer-rod in joint between window door or louver frame and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer’s instructions and ASTM C 1193.
I. Position weather barrier head flap across head flashing. Adhere using flashing membrane or type as recommended by weather barrier manufacturer over the 45-degree seams.
J. Tape top of window in accordance with weather barrier manufacturer’s recommendations.
K. Seal interior side of opening as required.
L. Where jambs in cavity wall construction are detailed with stainless steel flashings, seal flashings to wall with self-adhering membrane flashings.

3.07 OPENING PREPARATION (FOR USE WITH FLANGED WINDOWS)

A. Cut weather barrier in a modified "I-cut" pattern., per manufacturer’s recommendations and instructions.
    1. Cut weather barrier horizontally along the bottom of the header.
    2. Cut weather barrier vertically 2/3 of the way down from top center of window opening.
    3. Cut weather barrier diagonally from bottom of center vertical cut to the left and right corners of the opening.
    4. Fold side and bottom weather barrier flaps into window opening and fasten.
B. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

3.08 FLASHING (FOR USE WITH FLANGED WINDOWS)

A. Cut sill flashing membrane a minimum of 12 inches longer than width of sill rough opening.
B. Cover horizontal sill by aligning sill flashing membrane edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
C. Fan sill flashing membrane at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges.

D. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill.
E. Install window according to manufacturer’s instructions.
F. Apply 4-inch-wide strips of flashing membrane at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing.
G. Apply 4-inch-wide strip of flashing membrane at the window head flashing overlapping the mounting flange. Head flashing membrane should extend beyond outside edges of both jamb flashings.
H. Position weather barrier head flap across head flashing. Adhere using 4-inch-wide flashing membrane over the 45-degree seams.
I. Tape head flap in accordance with manufacturer recommendations.
J. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer’s instructions and ASTM C 1193.

3.09 PROTECTION

A. Protect air barrier system from sparks, open flames and damage during application and remainder of construction period, according to manufacturer's written instructions.
   1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed to these conditions for more than 180 days.
B. Protect air barrier from contact with solvents, coatings, mastic or sealants not approved by air barrier manufacturer
C. Inspect for damage just prior to installation of exterior finish materials and promptly repair damaged conditions.

END OF SECTION 07 27 19

SECTION 07-3113 – SHINGLE ROOFING & FLASHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide fiberglass reinforced asphalt shingle roofing as described in this section of the specifications and / or as shown on the drawings.
B. Related Sections include the following:
   1. Division 06 Section - Roof Sheathing.
   2. Division 07 Section - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

A. References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.
   1. ASTM - American Society for Testing and Materials, Philadelphia, PA.
   2. FM - Factory Mutual Engineering and Research, Norwood, MA.
   3. NRCA - National Roofing Contractors Association, Rosemont, IL.
   4. OSHA - Occupational Safety and Health Administration, Washington, DC.
   5. SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Chantilly, VA
   6. UL - Underwriters Laboratories, Northbrook. IL

1.04 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane underlayment and shingles shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Shingle roofing and flashings shall be installed in accordance with NRCA Roofing Manual: Steep-slope Roof Systems, and shall remain watertight.
B. Testing Requirements: The roof system shall be tested in compliance with local code requirements and as follows:
   1. Wind Resistance: The roof system shall be tested in compliance with ASTM D 7158, and with classification F per ASTM D 3161.
      a. In high wind applications underlayments shall comply with additional requirements as required per local codes.
   2. Fire Classification: The system shall be identified and listed for the fire class as required by local code by an approved testing agency, tested in compliance with ASTM E 108 or UL 790.
   3. Hail Resistance Classification: VSH, UL 2218 Class 4.
   4. ASTM D3018, Type 1 for self-sealing type shingles

C. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
D. Jobsite Safety: Execute all operations and provide a safe work environment in accordance with OSHA standards and regulations.
    1. Follow all industry, code, fire prevention guidelines and requirements for storage of materials, staging areas, roof access, and application means and methods.

1.05 QUALITY ASSURANCE

A. Acceptable manufacturers: Minimum of Five years in manufacture of Fiberglass shingles.
B. Underwriters' Laboratories Label:
    1. Fiberglass Reinforced Asphalt Shingles: Class-A fire resistance rating.
C. Installer Minimum Qualifications: Installer shall be a Manufacture trained and certified installer, licensed or otherwise authorized by all federal, state and local authorities to install all products specified in this section. Installer shall perform work in accordance with NRCA Roofing and Waterproofing Manual.
D. To the greatest extent possible provide a complete roofing system from a single manufacturer in compliance with required warranties.
E. Install shingles to meet requirements of manufacturer's instructions.
F. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
    1. Finish areas designated by architect
    2. Do not proceed with remaining work until workmanship, color and pattern are approved by Architect.
    3. Rework Mock-Up area as required to produce acceptable work.
G. Pre-Installation conference: Conduct a pre-installation conference at the job site to comply with Division 01 requirements, to occur not less than 1 week before beginning the roofing installation. Include General Contractor, Manufacturer's representative, roofing installer, and other trades directly interfacing with or affecting the roofing work. Non-mandatory attendees shall include the Architect and Owner's representative. General Contractor shall record meeting minutes and shall distribute to Architect and other affected parties within 3 days following the conference. Review, at a minimum, the following:
    1. All pertinent requirements for the project including but not limited to requirements of the specifications, code requirements, and requirements to achieve warranty.
    2. Materials to be used and their proper application.
    3. Proper storage and handling of materials, including temporary roof structure loading requirements and limitations.
    4. Weather and environmental considerations and requirements.
    5. Scheduling and duration of the work.
    6. Architect's submittal review comments, as applicable.
    7. Requirements for roofing installation related the work to be performed by other trades interfacing with the roofing system.
    8. Construction details and any special conditions, including those that may affect warranty coverage if not properly executed.
    9. Provisions for proper roof ventilation through the ventilated nail base.
    10. General Contractor's and Roofing Installer's safety requirements, as applicable.
    11. Any other open questions and requirements as necessary to make progress and avoid delays.

1.06 SUBMITTALS

A. Product Data: Provide copies of manufacturer’s product data information and samples for each type of roofing product.
B. Shop Drawings: Provide drawings to indicate specially configured metal flashing, jointing methods and locations and installation details as required by project conditions indicated
C. Samples:
    1. Shingles: Two of each style selected indicating full range of colors.

2. Accessories: Two of each item of finish specified.

D. Informational Submittals:
   1. Manufacturers Application Instructions: Provide manufacturer’s application instructions that indicate preparation required, installation procedures, and detail drawings
   2. Installer Qualifications.
   3. Certifications.
   4. Sample Warranty.

1.07 PRODUCT DELIVERY, STORAGE & HANDLING

A. Deliver materials with manufacturer's labels intact and legible.
B. Deliver materials with manufacturer's labels intact and legible. Deliver materials in sealed packages with Underwriters' Laboratories, Inc. labels.
C. Store materials on raised platforms and protect with coverings at outdoor locations, at no more than 110 degrees F.
D. Do not stack bundles of shingles more than 4 ft. high.
E. Store rolled goods on end.

1.08 JOB CONDITIONS

A. Anticipate and observe environmental conditions (temperature, humidity and moisture) within limits recommended by manufacturer for optimum results. Do not install products under environment conditions outside manufacturer’s absolute limits.
B. Do not install underlayment or shingles on wet surfaces.
C. Do not apply shingles when air temperature is below 40 degrees F.

1.09 WARRANTY

A. Shingle Roof: Provide manufacturer's Limited 40-year Warranty with 100% material coverage for 5 yesrs, non-prorated, and 10 year warranty against algae discoloration.

1.10 EXTRA MATERIALS

A. Provide (2) packages of asphalt shingles from same run as project, in unopened bundles.

PART 2 - PRODUCTS

2.01 SHINGLES

A. Manufacturer: Design for shingle roofing is based on products as manufactured by GAF. Subject to compliance with requirements, provide the named products, or approved comparable products by another Manufacturer.
   1. Architect reserves right to reject comparable products or substitution requests based on available color options and other aesthetic qualities if, based on Architect's sole opinion, the products are not equal in these respects.
B. Provide fiberglass reinforced asphalt shingles: Basis of Design Shingles - "Timberline ArmorShield II" as manufactured by GAF Materials Corp., Wayne, NJ (800) 766-3411, or approved equal.
   1. U.L.790 Class "A" Fire Resistant
   2. U.L. 2218 Class 4 Impact Resistance
   3. ASTM D3462 fiberglass reinforced asphalt shingles
   4. ASTM D3018, Type I Self-Healing shingles
   5. ASTM D3161 Type 1 Class F Wind Resistant
   6. ASTM D7158, Class H Wind Resistant
   7. Stain Guard Protection additive
   8. Color shall be selected by Architect from manufacturer's standard color range.

C. Shingles: UL 2218, Class 4, granule surfaced self-sealing asphalt shingle with a strong fiberglass reinforced Micro Weave core and StainGuard protection, which prevents pronounced discoloration from blue-green algae through formulation/unique blends of granules. Architectural laminate styling provides a wood shake appearance with a 5 5/8in. exposure. UL 790 Class A rated with UL 997 Wind Resistance Label; ASTM D 7158, Class H; ASTM D 3161, Type 1; ASTM D 3018, Type 1; Passes UL 2218, Class 4 Impact Test; ASTM D 3462; AC438 compliant; Dade County Approved, Florida Building Code Approved, Texas Dept of Insurance Approved, ICC Report Approval. Timberline® ArmorShield™ II Shingles, by GAF, or approved equal.
   1. Color: GAF “Charcoal or as selected by Architect from Manufacturer’s available colors.
   2. Hip and Ridge shingles: Self-sealing hip and ridge cap shingle, matching color of roof shingle, designed to work with ridge vents. Style as selected by Architect from Manufacturer's available styles. GAF "Timbertex", or equal.
   3. Starter strips: Manufacturer's standard self-sealing starter shingles designed for use with shingles as specified and for indicated warranty.

2.02 ROOFING UNDERLAYMENT

A. Self-Adhering, High-Temperature Underlayment: Basis of Design – StormGuard Film-Surfaced Leak Barrier, cold-applied, sheet underlayment, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
   1. U.L.790 Class "A" Fire Resistant
   2. ASTM D5147 Thickness 40 mils
   3. ASTM D1970 Thermal Stability: Stable after testing at 240 deg F
   4. ASTM D1970 Low-Temperature Flexibility: Passes after testing at minus 20 deg F
   5. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. W.R. Grace & Co.
      b. Henry Company.
      c. Johns Manville.
      d. Owens Corning.
      e. Polyguard Products, Inc.

2.03 RADIANT BARRIER ROOF SHEATHING

A. APA rated 48/24 radiant barrier sheathing, exterior type, minimum 5/8" equal to "TechShield", by LP Building Products, Nashville, TN (888) 820-0325.

2.04 ROOF VENTILATION

A. Roof Vents at high end of Roofs: Provide continuous ridge vents at all ridges unless otherwise noted in Drawings. Provide continuous high end of roof to vents at all high-end roof conditions unless otherwise noted in Drawings. Also provide ridge vents at hips where hip vents are required by ventilation requirements and where hip vents are specifically indicated in Drawing.
   1. Ridge Vents: Polypropylene, baffled vent with 18 square inches/linear foot, equal to "Cobra Ridge Vent 3" by GAF Materials Corp.
   2. High end Roof Vents: Provide continuous high eave and roof to rise wall roof ventilation acceptable to roofing Manufacturer, equal to GAF, "Cobra Exhaust Vent.
      a. Provide 1x pressure treated blocking between sections of ventilation material, per Manufacturer’s recommendations and installation instructions.
   3. Open area of exhaust vents: 12 sq. in. per lineal foot, unless noted otherwise.
B. Intake Soffit Vent: Shall be GAF MasterFlow LSV8 Series or approved equal.

2.05 FLASHING

A. Refer to Division 07 “Sheet Metal Flashing and Trim” for additional flashing requirements.

2.06 METAL FLASHING AND TRIM

A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
   1. Sheet Metal: Stainless steel.
   2. Pre-finished steel where exposed with baked on acrylic color coating is indicated: 24 ga hot dip galvanized steel sheet flashing and drip edges, complying with ASTM A 635, G90/Z275.
      a. Color(s) as selected by the Architect to suit adjacent finish material(s).

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item unless otherwise specified in this Section or indicated on Drawings.
   1. Continuous Apron Flashings: Fabricate with lower flange a minimum of 5 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
   2. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 6 inches over the underlying asphalt shingle and 5 inches up the vertical surface.
   3. Cricket and Backer Flashings: Fabricate with concealed flange extending a minimum of 24 inches beneath upslope asphalt shingles and 6 inches beyond each side of vertical obstruction to downward flow of water, and 8 inches above the roof plane at vertical legs.
   4. Counterflashings: Fabricate to cover 4 inches of base flashing measured vertically; and in lengths required so that no step exceeds 8 inches and overall length is no more than 10 feet.
      a. Provide metal reglets or receivers for installation.
   5. Open-Valley Flashings: Fabricate from metal sheet not less than 24 inches wide in lengths not exceeding 10 feet, with 1-inch-high, inverted-V profile water diverter at center of valley and equal flange widths of not less than 11 inches.
      a. Hem flange edges for fastening with metal cleats.
      b. Add stiffening ribs in flashings to promote drainag].
   6. Drip Edges: Fabricate in lengths not exceeding 10 feet with minimum 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.
   7. Vent-Pipe Flashings: Refer to Division 07 Section “Sheet Metal Flashing and Trim.

2.07 ACCESSORIES

A. Nails: Hot galvanized aluminum 11 or 12 ga. barbed shank, 3/8" head, sharp pointed conventional, of sufficient length to penetrate through plywood sheathing. Staples shall not be used.
B. Asphalt Plastic Cement: ASTM D 4586, Type 1.
C. Starter Strip: Self-sealing starter shingle designed for premium roof shingles. WeatherBlocker™ Eave/Rake Starter Strip by GAF.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Do not begin installation until the roof deck has been properly prepared.
B. Verify that the deck is dry, sound, clean and smooth. It shall be free of any depressions, waves, and projections.
C. Cover with sheet metal, all holes over 1 inch (25mm) in diameter, cracks over 1/2 inch (12mm) in width, loose knots and excessively resinous areas.
D. At areas that receive eave protection membrane, fill knotholes and cracks with latex filler.
E. Replace damaged deck with new materials.
F. Clean deck surfaces thoroughly prior to installation of eaves protection membrane and underlayment.

3.02 INSTALLATION OF UNDERLAYMENT AND VENTING

A. Apply per roofing Manufacturer's installation instructions, in accordance with local building codes, and the following. When local codes, these specifications, and application instructions are in conflict, the most stringent requirements shall take precedence.
B. Self-Adhering Underlayment and Flashing:
    1. Install underlayment membrane continuously across entire roof surface in accordance with shingle roofing Manufacturer's installation instructions for the membrane.
    2. Install flashing membrane at roof penetrations, according to details in Drawings, and in accordance with Manufacturer's requirements.
    3. At fascia, install underlayment from top of insulation in nail base panel, down face of plywood, and wrapping under and covering plywood and wood blocking at bottom edge of fascia.
    4. Install at additional other locations as indicated by Manufacturer's installation instructions or technical representative to achieve specified warranty.
    5. Install membranes without wrinkles, puckers, or other defects that may allow water to get below the defect, or that may show telegraphing through the installed shingles. In the event that such conditions occur and membrane has adhered to the point that it can not be repositioned, remove or repair conditions in accordance with Manufacturer's instructions.
C. Penetrations: Follow details in Drawings unless Manufacturer's requirements are more stringent or Manufacturer will not warranty roofing with detail as indicated. In the event of conflict, use the most restrictive requirement that will achieve roof warranty.
    1. Pipe Penetrations: Install flashing membrane to metal flashing pipe seal sleeve or flashing flange to deck on high side, and to deck or over underlayment on the low side as indicated by roofing Manufacturer. Shingle in underlayment over and around the flashings.
    2. Vertical Walls at continuous venting of vented nail base:
        a. Cut nail base back approximately 2" from rise wall.
        b. Install shingle roofing up to top edge of nail base as at a vented ridge condition.
        c. Install half-width vent material (GAF "Cobra Exhaust Vent") at top edge of roof, with 1x3 exterior grade pressure treated wood nailers (nailers painted black on exposed edge), per Manufacturer’s instructions.
        d. Install prefinished metal flashing as indicated in Drawings, up wall and onto roof over and extending 1" past edge of the exhaust vent material; metal flashing hemmed 1/2" on underside.
        e. Install approximately half-width cap shingle to cover metal flashing, set in bed of roofing plastic cement.
    3. Rake edges: Install metal edge flashing / fascia trim over eaves roof deck underlayment. Lap joints at least 2" and seal with plastic cement. Fasten at spacing indicated by Manufacturer or local code requirements whichever is most stringent.
    4. Ridge vents: Refer to Division 06, Section "Sheathing" for ventilated nail base panel. The ventilated nail base is designed to vent at the air space between the nail base and insulation layers. Nail base installer shall leave a continuous open gap between nail base on either side of the ridge that is sufficient to ensure that the open area between the nail base at the ridge will be greater than that of the continuous ridge vent's open area; but not greater than the maximum open space per ridge vent Manufacturer's installation instructions. The insulation layer of the nail base panel shall be cut at a mitered angle to come to closure below the nail base per ventilated nail base Manufacturer's installation instructions. Install underlayment from top of nail base board on each side of the ridge and, adhered to OSB nail base at least 6" at the top and lapping over and adhered to next top course of underlayment by at least 6". Do not obstruct air pathway of the ridge vent. Install continuous ridge vents per Manufacturer's instructions.
D. Do not allow underlayment materials to remain uncovered by roofing or exposed to sunlight or the elements for longer duration than allowed by the roofing materials Manufacturer.

3.03 INSTALLATION OF SHINGLE ROOF

A. General:

1. Install in accordance with Manufacturer's instructions, the following specifications, and local building codes. In the event of a conflict, the most stringent requirements shall take precedence.
2. Minimize breakage of shingles by avoiding dropping bundles on edge, by separating shingles carefully (not by "breaking" over ridge or bundles), and by taking extra precautions in temperatures below 40 degrees F (4 degrees C).
3. Handle carefully in hot weather to avoid scuffing the surfacing or damaging the shingle edges.

B. Flashings and Metal Drip Edge: Install according to Manufacturer's installation instructions and the following:
1. Rake and High Edges: Install metal edge flashing over self-adhering / eaves protection membrane and roof deck underlayment; set tight to rake boards; lap joints at least 2 inches (51mm) and seal with plastic cement; secure with nails.
   a. Ensure ventilation path at high roof edges is unobstructed and does not restrict air flow to less than the open area per lineal foot of the ventilation system exhaust vents.
2. Low Edges: Install metal edge flashing over first layer of self-adhering membrane at the low eave, and secure with nails. Install shingled into (below) top layer of underlayment.
   a. Ensure that ventilation path at roof edge or fascia as applicable is unobstructed and does not restrict air flow to less than the open area per lineal foot of the ventilation system intake vents.
3. Vent pipes: Install self-adhering membrane lapping over flashing flanges on roof deck, properly shingled into underlayment per Manufacturer's installation instructions. Press to seal tightly to pipe flashing and underlayment.

C. Shingles:
1. Use starter strip shingles.
2. Starter strip and shingles shall always overhang the eaves and rake by 1/2". Nail starter strip using same spacing as for shingles and locate nails about 1" up from the bottom edge. Avoid nailing where cut-outs will occur on the first course of shingles.
3. Snap chalk lines to guide application. For standard 12" x 36" three-tab shingles, horizontal chalk lines should be snapped every other row 10" apart to maintain level lines parallel with eaves and ridge.
4. First and succeeding courses: Snap chalk lines parallel to edge (rake) of roof 5-1/2", 11-1/2", 17-1/2", 23-1/2", 29-1/2" and 35-1/2" in from the edge. Use these as the guides to keep the shingle cut-outs in alignment during application.
   a. Start the first "course" (or "row") with a full shingle. Align it to the 35-1/2" chalk line and with the butt edge flush with the starter course edge. This will give the required 1/2" overhang on both rake and eaves.
   b. Cut 6" off outside edge of next (second) course and align it to the 29-1/2" chalk line.
   c. Cut 12" off the outside edge of the next (third) course and align it to the 23-1/2" chalk line.
   d. A cut-out must never come over a cut-out in the row immediately below. Repeat this pattern up the roof cutting 6" off each succeeding row. When the last piece is installed, which is 6" wide, return to eaves and apply full shingles in each row up the roof. Start the 7th row with a full shingle at the rake, repeating the above pattern.
   e. For best distribution of color blend, each row shall be run at least 4 shingles across the roof before proceeding to the next row.
   f. For 2-tab and no cut-out shingles, use a 9" off-set instead of a 6" offset.
   g. For laminated overlay, use random offset or repeat sequence of full shingle, 4-1/2" offset shingle, 7-1/2" offset shingle.
5. Nailing shall be as recommended on bundle wraps and manufacturer's recommendations. Staples shall not be used.
6. Replace damaged shingles.

3.04 CLEANING AND PROTECTION

A. Protect installed roofing as required to prevent damage due to foot traffic and construction operations until completion of the project.

1. Repair or replace damaged to roofing system components due to construction operations in manner acceptable to Manufacturer, and at no additional cost to Owner. Additionally, make such repairs in a manner that, in the sole opinion of the Architect, are visually imperceptible as an aesthetic defect in the finished work.

B. Any roof areas not completed by the end of the workday shall be protected from moisture and contaminants.

C. Remove excess materials and shingles not part of attic stock, and other debris, from project site.

END OF SECTION 07 31 13

SECTION 07-4113.16 – STANDING-SEAM METAL ROOF PANELS (ALTERNATE)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Standing-seam metal roof panels. Work includes all labor, materials, equipment and services necessary for fabrication and installation and/or replacement of metal wall panels, aluminum battens and metal patches as shown on drawings and as herein specified.
      a. Basis of Design Standing Seam Roofing
   2. Gutters and Downspouts
   3. Underlayment Materials
   4. Snow Guard System

B. Related Sections:
   1. Division 06 Section - Sheathing for insulated nail base.
   2. Division 07 Section - Sheet Metal Flashing and Trim.
   3. Division 07 Section - Roof Specialties.
   4. Division 07 Section - Roof Accessories.
   5. Division 07 Section - Joint Sealers.

1.03 REFERENCE STANDARDS

A. References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.
   1. ASTM - American Society for Testing and Materials, Philadelphia, PA.
   2. FM - Factory Mutual Engineering and Research, Norwood, MA.
   3. NRCA - National Roofing Contractors Association, Rosemont, IL.
   4. OSHA - Occupational Safety and Health Administration, Washington, DC.
   5. SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Chantilly, VA
   6. UL - Underwriters Laboratories, Northbook. IL

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
   2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
   4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.

5. Review structural loading limitations of [**deck**] [**purlins and rafters**] during and after roofing.
6. Review flashings, special details, drainage, penetrations, equipment curbs, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
8. Review temporary protection requirements for metal panel systems during and after installation.
9. Review procedures for repair of metal panels damaged after installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
   2. Submit Manufacturer's Product Safety Data Sheets for each product.

B. Shop Drawings:
   1. Shop drawings based on the Contract Documents and field conditions of each metal panel type, profile and trim configuration to be replaced and/or installed.
   2. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
   3. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
   1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Letter from Manufacturer stating acceptance of proposed underlayment for use with their products **and for specified special warranty**.

C. Product Test Reports: For each product, for tests performed by a qualified testing agency. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.07 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.08 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer. Fabricator and erector shall demonstrate experience of a minimum of five years of related industry experience.

B. Design Criteria: Engineering panels for structural properties in accordance with the latest edition of the American Iron and Steel Institute "Cold Formed Steel Design Manual", using "effective width" concepts.

C. Metal Shapes Design Criteria: Conform to latest edition of Sheet Metal and Air Conditioning Contractors National Association (SMACNA)..

D. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

E. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical roof area and eave, including fascia, and soffit, approximately 48 inches (1200 mm) square by full thickness, including attachments, underlayment, and accessories.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Storage:
   1. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
   2. Panels should be stored on edge in a clean dry place. One end should be slightly elevated to allow moisture to run off rather than accumulate on the faces.
   3. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
   4. Panels with strippable plastic film must not be stored in the open, exposed to the sun. Retain strippable protective covering on metal panels during installation.

C. Handling:
   1. Prevent contact with materials during storage which may cause discoloration or staining.
   2. In handling prefinished panels, lift up panels and do not slide panels when un-stacking.
   3. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Jobsite Safety: Execute all operations and provide a safe work environment in accordance with OSHA standards and regulations.
   1. Follow all industry, code, fire prevention guidelines and requirements for storage of materials, staging areas, roof access, and application means and methods.

1.11 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.
2. Warranty Period: **Two** years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 10 years from date of Substantial Completion.

C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

B. Testing Requirements: The roof system shall be tested in compliance with local code requirements and as follows:
1. Wind Resistance: Through-fastened roof panel systems tested in compliance with UL 580 or UL 1897. Standing seam attached systems tested in compliance with UL 580 or ASTM E 1592.
2. Physical Weathering Properties: The system shall be tested to demonstrate physical integrity over the working life of the roof based upon 2,000 hours of exposure to accelerated weathering tests conducted in accordance with ASTM G152, ASTM G154, or ASTM G155.
   a. Corrosion Resistance: Metal panels shall have corrosion resistance in accordance with local code requirements for the materials indicated.
3. Impact Resistance: The system shall be tested to resist impact damage based on the results of tests conducted in accordance with ASTM D3746, ASTM D4272, CGSB 37-GP-52M, or the "Resistance to Foot Traffic Test" in Section 5.5 of FM 4470.
4. Fire Classification: The system shall be identified and listed for the fire class as required by local code by an approved testing agency, tested in compliance with ASTM E 108 or UL 790.

C. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:
1. Wind Loads: As required by code and indicated on Drawings, whichever is greater.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E1680 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646 at the following test-pressure difference:
1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

F. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E2140.

G. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
   1. Uplift Rating: UL 90.
   2. Hail Resistance: SH.

H. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.02 STANDING-SEAM METAL ROOF PANELS

A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
   1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.
   2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1637.

B. Metal Roofing Panels: Basis of Design shall be 24 Gauge steel, 16" x 2" smooth striated face, interlocking, Galvalume steel panel with concealed fastening system and high-grade hot melt elastomeric sealant to seal adjoining panel legs. Fascia and gutter shall be pre-formed, custom design as shown on drawings, fabricated of same material as roof panels. Panel shall be Berridge "Zee-Lock" standing seam metal roofing panels, with Kynar 500/Hylar 5000 premium fluoropolymer coating in color as selected by Architect from Manufacturer's standard range, or approved equal.
   1. Manufacturer's Standard: Provide continuous vents at ridges and at high side of roofs to vertical walls.
   2. Manufacturers producing products that may be used, based on conformance with specified requirements include:
      a. MBCI "BattenLok HS"
      b. Centurion Industries "A-Lert KR Roof System"
   3. Finish Color: As selected by Architect.

C. Insulation – Reference section 06 16 00 Sheathing

2.03 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
   1. Thermal Stability: Stable after testing at **240 deg F**; ASTM D1970.
   2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D1970.
   3. Products: Subject to compliance with requirements and approval of roofing panel Manufacturer. Product provided must be acceptable to roofing panel Manufacturer for use with their products and specified warranty. Coordinate details for interface of underlayment provided with other air barrier and dampproofing systems as indicated in other Division 07 Sections. Acceptable products may include the following::
      a. Carlisle Residential; a division of Carlisle Construction Materials; WIP 300HT.
      b. Grace Construction Products; W.R. Grace & Co. -- Conn.; Grace Ice and Water Shield HT.
      c. Polyglass a MAPEI Company, 60 mil. Polystick MTS

2.04 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
   1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
   2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
   3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

C. Gutters: Formed from same material as roof panels, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2400-mm-) long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of 36 inches (914 mm) o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

D. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Finish downspouts to match gutters.

E. Roof Curbs: Fabricated from same material as roof panels, **0.048-inch (1.2-mm)** nominal thickness; with bottom of skirt profiled to match roof panel profiles and with welded top box and integral full-length cricket. Fabricate curb subframing of 0.060-inch- (1.52-mm-) nominal thickness, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Finish roof curbs to match metal roof panels.
   1. Insulate roof curb with 1-inch- (25-mm-) thick, rigid insulation.

F. Panel Fasteners: Self-tapping screws designed to withstand design loads.

G. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
   1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
   2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
   3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

H. Snow and Ice Guards: Metal snow guards for standing seam metal roofing.
   1. Basis of Design: Single rail Snow Retention System with C-2-1-Z clamp on brackets and 3/4"snow fence pipe by Tra Snow & Sun Roof Accessory Systems, or approved equal conforming to the following specifications: ASTM A500 and ASTM A240
   2. Material: Steel
   3. Finish: Powder Coated, color to match standing seam roof.
   4. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.
   5. Provide professional engineer's delegated-design engineering services to evaluate and design system so expected snow dead loads do not exceed roof structure capacity. Including documentation that engineer is licensed in the state in which Project is located.

6. Contractor to coordinate snow guard system with standing seam roof type and manufacturer

2.05 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
   1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
   2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
   3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
   4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
   5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
   6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
      a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.06 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 COORDINATION AND EXAMINATION

A. Coordinate with other trades, prior to rough-in and penetrations, exact locations for roughing-in of components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels. Pipe and other small penetrations shall not be located in roof panel seams. Large equipment shall be located to avoid valleys and

damming conditions to the maximum extent possible. Examine and confirm these locations again before installation to avoid conflicts.

1. Provide metal roof panel crickets at roof curbs that do not fit entirely between the seams of a single roof panel with at least 2" to the seam on both sides. Coordinate size of crickets with actual equipment and curbs to be provided. Coordinate height of curbs as required for crickets prior to ordering curbs.
2. Contractor is responsible to relocate pipe and similar penetrations as required to avoid seams, and to relocate curbs and larger equipment as required to avoid dams or other ponding conditions. Contractor shall not be due additional compensation to relocate items and make other corrections as required due to failure of Contractor to coordinate between trades.

B. Fabricator and erector are responsible for inspecting existing conditions to verify general conditions, panel profiles and panel attachments and examine all parts of existing building affecting the installation of his work.

C. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

D. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.03 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated [below] [on Drawings], wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Extend underlayment into gutter trough. Roll laps with roller. Cover underlayment within 14 days.

1. Apply over the entire roof surface.
2. Continue underlayment down face of sheathing behind fascia and above soffit panels, and coordinate with air barrier or dampproofing installation at wall to seal the two systems together as required for a continuous weather barrier and air leakage control.
3. Where underlayment meets other weatherization barriers behind materials other than roofing, coordinate with installers of adjacent materials to provide continuous weatherization of the envelope, including accommodation for any chemically incompatible materials.

B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.04 INSTALLATION OF STANDING SEAM METAL ROOF PANELS

A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor

metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:
   1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
   2. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
   3. Copper Panels: Use copper, stainless steel, or hardware-bronze fasteners.
   4. Stainless Steel Panels: Use stainless steel fasteners.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
   1. Install clips to supports with self-tapping fasteners.
   2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
   3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
   4. Watertight Installation:
      a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
      b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
      c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
   1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

H. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

I. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.
1. Provide elbows at base of downspouts to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

J. Roof Curbs: Install flashing around bases where they meet metal roof panels.

K. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.05 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.06 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.07 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. Do not allow protective coatings to melt onto roof panel surfaces. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. For metal surfaces intended to weather or patina, wear gloves and take precautions to avoid spills, oil from hands and skin, etc. that can leave marks or cause uneven weathering of panel surfaces. Require the same of other trades working on or near panel surfaces after installation.

C. Protect panels from damage during remainder of construction period. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and / or Owner.

END OF SECTION 07 41 13.16

SECTION 07-4646 – MINERAL FIBER CEMENT SIDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. This Section includes Pre-Stained & Paint-Grade for the following:
   1. Fiber-cement siding and accessories.
   2. Fiber-cement panels and accessories.
   3. Fiber-cement trim.
B. Related Sections include the following:
   1. Division 06 Section - Rough Carpentry.
   2. Division 06 Section - Finish Carpentry for wood and wood-based sidings and for exterior trim.
   3. Division 07 Section - Sheathing.
   4. Division 07 Section - Sheet Metal Flashing and Trim for flashing, gutters, and other sheet metal work.
   5. Division 07 Section - Joint Sealers.
   6. Division 07 Section - Weather Resistant Barrier for building wrap application.
   7. Division 07 Section - Flexible Flashing for door and window flashing.
   8. Division 09 Section - Painting.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated, including material descriptions, available colors, dimensions and available finishes & patterns
B. Samples for Verification: For each type, color, texture, and pattern required.
   1. 12-inch- long-by-actual-width Sample of siding.
C. Maintenance Data: For each type of product indicated.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain each type, color, texture, and pattern of siding and soffit**,** including related accessories, through one source from a single manufacturer.
B. Mockup: Build mockup to verify selections made under sample submittals and to demonstrate aesthetic effects.
   1. Build mockup of typical wall area as shown on Drawings.
   2. Build mockup approximately 48 inches long by 60 inches high. Include outside corner on one end of mockup and inside corner on other end.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store materials in a dry, well-ventilated, weathertight place.

1.06 PROJECT CONDITIONS

A. Weather Limitations: Proceed with siding installation only if substrate is completely dry and if existing and forecasted weather conditions permit siding to be installed according to manufacturer's written instructions.

1.07 SEQUENCING

A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace siding that does not comply with requirements or that fails within specified Warranty period. Failures include, but are not limited to, cracking, deforming, fading or otherwise deteriorating beyond normal weathering.
   1. Warranty Period: 25 years, from date of Substantial Completion.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Furnish full lengths of soffit and trim in a quantity equal to 2 percent of amount installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturer’s offering Products which may be incorporated in the Work include the following:
   1. CerainTeed Corporation, (800) 233-8990
   2. James Hardie Building Products, (800) 9-HARDIE.

B. Basis-of-Design Product: The design for each siding, accessories and soffit is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified:

2.02 SIDING

A. Paint-Grade Fiber-Cement Lap Siding: Siding made from fiber-cement board that does not contain asbestos fibers; complies with ASTM C 1186, Type A, Grade II; is classified as noncombustible when tested according to ASTM E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.
   1. Basis-of-Design Product: James Hardie Inc., Select Cedar Mill Hardiplank Lapsiding & trim, or , comparable product, as approved by Architect.
   2. Type: Boards 9-1/4 inches in plain style (8" exposure).
      a. Texture: Smooth.
   3. Factory Priming: Manufacturer's standard acrylic primer.

2.03 SOFFIT

A. Fiber-Cement Soffit: Panels made from fiber-cement board that does not contain asbestos fibers; complies with ASTM C 1186, Type A, Grade II; is classified as noncombustible when tested according to ASTM E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Basis-of-Design Product: James Hardie, Inc. soffit panels or a comparable product as approved by Architect:
2. Pattern: 12-inch- wide sheets with smooth texture or width as required at porches typical.
3. Factory Priming: Manufacturer's standard acrylic primer.

2.04 ACCESSORIES

A. Fiber-Cement Accessories: Provide trim and other items as recommended by manufacturer for building configuration. Sizes as required, or as indicated on the drawings.
   1. Texture: Smooth.
   2. Finish: Manufacturer's standard primer.
B. Decorative Accessories: Provide the following types of decorative accessories as indicated:
   1. Corner boards.
   2. Door and window casings.
   3. Fasciae.
   4. Moldings and trim.
C. Colors for Decorative Accessories: Match adjacent siding.
D. Flashing: Provide aluminum flashing complying with Division 07 Section - Sheet Metal Flashing and Trim at window and door heads and where indicated.
   1. Finish for Aluminum Flashing: Factory-prime coating.
E. Elastomeric Joint Sealant: Single-component urethane joint sealant complying with requirements in Division 07 Section - Joint Sealants for Use NT (nontraffic) and for Uses M, G, A, and, as applicable to joint substrates indicated, O joint substrates.
F. Fasteners:
   1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
   2. For fastening aluminum, use aluminum fasteners. Where fasteners will be exposed to view, use prefinished aluminum fasteners in color to match item being fastened.
   3. For fastening fiber-cement siding, use hot-dip galvanized fasteners.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.03 INSTALLATION

A. General: Comply with siding manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply. Center nails in elongated nailing slots without binding siding to allow for thermal movement. Overlap joints to shed water away from direction of prevailing wind.
B. Fiber Cement Siding:
   1. Blind nail to sheathing.
   2. Locate splices at least 12 inches away from window and door openings. Splices shall not align on adjacent members.
   3. Wind Resistance: Where a specified level of wind resistance is required, lap siding shall be installed to framing members and secured with fasteners, as described in Table No. 2 of National Evaluation Service Report No. NER-405.

4. Surface nailing at splices may be required by Architect.

3.04 FINISHING

A. Pre-stained Finish as shown on the documents.
B. Painted Finish as shown on the documents.

3.05 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective siding materials and replace with new materials complying with specified requirements.
B. Clean finished surfaces according to siding manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 07 46 46

SECTION 07-4800 – FAÇADE ATTACHMENT SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section includes provision and installation of a thermally broken, exterior cavity wall attachment system for attachment of exterior cladding/veneer installed over exterior insulation (ci) and vapor barrier systems, including:
   1. Primary and secondary support rails
   2. Fasteners and accessories
B. Related Sections include the following:
   1. Division 01 Section “Mockups”
   2. Division 04 Section “Unit Masonry
   3. Division 06 Section "Sheathing".
   4. Division 07 Section "Thermal Insulation".
   5. Division 07 Section "Air Barriers".
   6. Division 07 Section “Siding/Cladding Systems”.
   7. Division 07 Section "Sheet Metal Flashing and Trim".
   8. Division 07 Section "Joint Sealants".
   9. Division 08 Section “Aluminum Entrances and Storefronts”

1.03 SYSTEM DESCRIPTION

A. System assembly of a fully engineered, thermally broken, highly corrosion resistant, exterior cavity wall attachment system fastened directly to the substrate which shall include the following components from the substrate out:
   1. Substrate: Wall framing assembly to Concrete masonry unit walls and Steel stud framed exterior walls.
   2. Support systems for rainscreen wall panel systems.

1.04 DESIGN REQUIREMENTS:

A. Manufacturer is responsible for designing system, including anchorage to structural system and necessary modifications to meet specified requirements and maintain visual design concepts.
B. Employ registered professional engineer, licensed to practice engineering in jurisdiction where Project is located, to engineer each component of rainscreen attachment system.
C. Structural Design: Exterior-insulated rainscreen wall assembly capable of withstanding effects of load and stresses from dead loads, wind loads, ice loads (if applicable) as indicated on Structural General Notes on Structural Drawings, and normal thermal movement without evidence of permanent defects of assemblies or components.
   1. Thermal Movements: Provide assemblies that allow for thermal movements resulting from the following maximum ambient temperatures by preventing overstressing of components and other detrimental effects:

a. Temperature Change (range): 120 degrees Fahrenheit (67 degrees C), ambient:

D. Support Framing/Attachment System:
   1. Frequency and spacing of brackets as indicated by manufacture in project specific engineering package.

E. Performance Requirements:
   1. Thermal Performance:
      a. Full constructed assembly must have a minimum 80% EFFECTIVE R-value when compared to the insulation's rated R-Value.
      b. Perform effective R-Value calculation or modeling in accordance with ASHRAE guidelines.
   2. Structural Performance:
      a. Framing Members: Localized bending stress for eccentrically loaded framing members must be evaluated with the maximum effective length of resisting element not more than 12 inches.
      b. Fasteners:
         1) Tension shall be taken as sum of direct tension plus tension due to prying for eccentrically loaded connections. Prying may be reduced or eliminated if proven via engineering analysis or testing.
         2) Minimum Safety Factor of 3 for both tension and shear values.
         3) Combined tension and shear shall be evaluated according to an interaction formula. Sum of terms shall not exceed 1.0.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and descriptions of testing performed on system components to indicate meeting or exceeding specified performance.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of support member and accessory.

B. Shop Drawings:
   1. Submit connection details to the cladding manufacturer, showing interface of rainscreen/veneer attachment system to substrate and with adjacent construction, signed and sealed by Professional Engineer.
   2. Show system installation and attachment, including fastener size and spacing.

C. Structural Calculations:
   1. Submit attachment support system manufacturer's comprehensive Structural Design analysis signed and sealed by a Professional Engineer.
   2. Structural analysis data including calculations, diagrams, and other submittals signed and sealed by the qualified engineer responsible for their preparation.

D. Samples: Submit following material samples for verification:
   1. Rails: Two (2) 12-inch-long samples.
   2. Fasteners: Two (2) sets of fasteners

E. Informational Submittals
   1. Qualification Data: For Installer.
   2. Test Reports: Comprehensive three-dimensional thermal modeling report indicating framing systems impact on exterior insulation rated R-value.
   3. Field quality-control reports.
   4. Sample Warranties: For special warranties.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Minimum 5 years' experience specializing in the manufacturing of façade attachment/support framing similar to those specified.
   2. Ability to demonstrate conformance to testing requirements.

B. Installer Qualifications:

1. Minimum of 3 years' documented experience or minimum of 5 completed projects of equivalent scope and quality and recommended by manufacturer to perform work of this Section.
2. Onsite superintendent or foreman overseeing installation on site during entire work of this Section with experience equivalent to installer and in good standing with the manufacturer.

C. Engineer Qualifications: Registered professional engineer experienced in the design of curtain wall systems, anchors, fasteners and licensed to practice engineering in the jurisdiction where Project is located.

D. Pre-Installation Meeting:
1. Meet with Owner, Architect, Owner's insurer if applicable, rainscreen veneer wall system supplier and installer, structural-support Installer, and installers whose work interfaces with or affects rainscreen wall system.
2. Discuss sequence and scheduling of work and interface with other trades.
3. Review metal wall framing assemblies for potential interference and conflicts and coordinate layout and support provisions for interfacing work.
4. Review and document methods, procedures and manufacturer's installation guidelines and safety procedures for exterior wall assembly.
5. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
6. Review methods and procedures related to rainscreen panel wall system installation, including manufacturer's written instructions.
7. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
8. Review flashings, special details, penetrations, openings, and condition of other construction that affect the rainscreen panel wall system.
9. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

E. Mock-up: In addition to product samples required in paragraph, Submittals, Build pre-construction mockup detailed on the drawings to verify selections made under Submittals, to demonstrate typical construction and waterproofing details, and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Prior to product installation a field-constructed mock-up shall be provided under the provisions of Division 1 Section - Submittals, Product Data, Samples and Mock-ups, to verify details & tie-ins, and to demonstrate the required quality of materials and installation.
2. Construct a typical exterior wall section, incorporating back-up wall, exterior cladding, window and sill, insulation, flashing and any other critical junctions (roof, foundation, etc.) as detailed in Drawings at typical wall locations as located by Architect.
3. Locate mockups as directed by Architect.
4. Build mockups as indicated in Drawings.
    a. Show typical components, attachments to building structure, and methods of installation.
5. Obtain Architect's approval of mockups before starting installation.
6. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
    a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
8. Demolish and remove mockups when directed.

1.07 QUALITY CONTROL

A. Single source responsibility:
   1. Furnish engineered rainscreen attachment system components under direct responsibility of single manufacturer.
B. Field Measurements: Verify actual supporting and adjoining construction before fabrication. Record field measurements on project record shop drawings.
C. Substrate Tolerances: The General Contractor is responsible for providing a substrate with a tolerance of 1/4 inch in 20.0 feet (6mm in 6m), on level, plumb, and location control lines as indicated and within 1/8 inch (3mm) offset of adjoining faces of alignment of matching profiles tolerances are noncumulative.

1.08 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials and components in manufacturers' original, unopened and undamaged containers or bundles, fully identified. Exercise care to avoid damage during unloading, storing and installation.
B. Store, protect and handle materials and components in accordance with manufacturer recommendations to prevent damage, contamination and deterioration. Keep materials clean, dry, and free of dirt and other foreign matter, and protect from damage due to weather or construction activities.

1.09 SEQUENCING

A. Ordering: Comply with manufacturers' ordering instructions and lead time requirements to avoid construction delays.
B. Coordinate construction to ensure that assemblies fit properly to supporting and adjoining construction; coordinate schedule with construction in progress to avoid delaying work.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of rainscreen/veneer wall system to be performed according to manufacturers' written instructions, specified requirements and warranty requirements.
A. Coordinate rainscreen/veneer wall system installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a ventilated, secure, and noncorrosive installation while maintaining the leakproof weather barrier.

1.11 WARRANTY

A. Manufacturer Warranties:
   1. Attachment System: Ten (10) year Limited Warranty.
      a. Covers components of the attachment system, including structural failure of components when all the materials and components are supplied and installed per manufacturer's requirements.
      b. Includes labor and material for removal and replacement of defective material.
      c. Includes labor to remove and reinstall façade finish, finish closures and façade finish accessories necessary to access defective material.
   2. Contractor's Warranties: 2-year labor warranty, starting from Substantial Completion, to cover repair of materials found to be defective as a result of installation errors.
   3. Limitation of Warranties: Exclude repairs, replacement, and corrective work to the substrate, primary structure, finish panels, and/or property – unless otherwise noted above. Warranties exclude mechanical damage due to abuse, neglect, primary structure failure, or forces of nature greater than normal weather conditions.

1.12 MAINTENANCE MATERIALS

A. Extra Materials: For use by Owner in building maintenance and repair, provide 3 percent additional rainscreen attachment components in new, unopened cartons, packaged with protective covering for storage and identified with appropriate labels.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Product: The design for the facade attachment system, is based on products produced by Knight Wall Systems ThermaZee thermally isolating girt system. (telephone: 855-597-9255). Subject to compliance with requirements, provide the named product, or approved equal product by another manufacturer.
   1. Subject to compliance with project requirements, manufacturers offering Products which may be incorporated in the Work include, but are not limited to the following:
      a. Advanced Architectural Producats, SMARTci GreenGirt 1-in-1 System, 959 Industrial Drive, Allegan, Michigan 49010, 269-355-1818, www.smartcisystems.com.
      b. Armatherm, Z Girt Structural Thermal Break system, 1 Titleist Drive, Acushnet, MA 02743, 844-360-1036, sales@armatherm.com.
      c. Knight Wall Systems, ThermaZee Cladding System, 2401 East 6th Street, Deer Park, WA 99006, 855-597-9255, sales@knightwallsystems.com.
      d. Strongwell,Corporation, Strongirt FRP Attachment Support System, 400 Commonwealth Ave., Bristol, Virginia 24201, 276-645-8000,

2.02 ATTACHMENT/SUPPORT FRAMING SYSTEM

A. Comply with ANSI/ASHRAE 90.1-2010.
B. Coating Material: ASTM A1046, Zinc-Aluminum-Magnesium, minimum thickness ZM40
   1. ASTM A653 Galvanized steel is not acceptable.
C. Steel Classification: Structural Steel (SS), Grade 50, 50 ksi Yield.
D. Spacing: Comply with manufacturer's Professional Engineer's project specific calculations.
E. Primary Vertical Girt.
   1. Minimum 0.046-inch thick (18 gauge) cold-formed steel.
   2. Z channel, front and back flanges of equal length to reduce prying action and one web.
   3. Web Perforations: Minimum 50-percent open area of web penetrating the insulation to reduce thermal transmittance and stop accumulation of water.
   4. Thermal Isolation:
      a. Located between the back flange and substrate.
      b. Continuous along the length of the girt for even load distribution and reduction in prying of substrate connection.
      c. Hollow, webbed or open with a minimum of 50-percent reduction in cross sectional area to reduce thermal transmittance.
      d. Minimum 0.25-inch thickness
      e. Thermal conductivity of less than 0.18 Watts per Meter-Kelvin.
      f. Designed to prevent the accumulation or damming of liquid water on upper edge.
   5. Pre-Punched Attachment Holes: 1.0 inch on center along length of back flange for proper wall anchor installation location relative to the web to reduce prying action and oversized to allow for thermal contraction and expansion of girt.
   6. Depth: As indicated on drawings
   7. Recommended Product: ThermaZee by Knight Wall Systems or approved equivalent.
F. Fasteners:
   1. Sufficient length to provide solid attachment to structure as required by manufacturer.
   2. Thermally isolated with a minimum 0.125-inch thick polymer washer.
   3. Framed substrate with sheathing: Self-drill hex-washer-head stainless steel with 1,000 hour salt-spray rated thermoset polyester coating.
      a. Embedment depth: 0.625 inches or three full threads minimum, whichever is greater.

b. Minimum ultimate pull-out capacity from 18 gauge steel: 450 pounds.

4. Concrete and concrete masonry units substrate:
   a. Embedment depth: 1.25 inches minimum.
   b. Minimum ultimate pull-out capacity from substrate material: 450 pounds.
   c. 1/4 inch Kwik-Con II+ by Hilti
   d. 1/4 inch Tapcon by Buildex
   e. 1/4 inch UltraCon by Elco Industries
   f. Or approved equal.

G. Accessories:
   1. Bracing, Furring, Bridging, Plates, Gussets, and Clips: Formed sheet steel, thickness as necessary to meet structural requirements for special conditions encountered.
   2. Galvanic Protection: Utilize tapes and other methods as necessary to separate and prevent contact between dissimilar metals.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate with other trades prior to beginning their work, including but not limited to metal stud and furring channel installer, to ensure substrates and conditions will be as required for panel installation.
   1. Ensure the proper size, shape, gauge, and location of furring strips will be installed at corners, perimeter of doors, windows, and other building openings, etc. as required to receive finish hardware and trim profiles indicated.
   2. Ensure studs, lintels and furring channels will be properly located as required to receive attachment clips near ends of panels and joints, and for shorter lengths of panel that may require additional studs or stud spacing closer than 16" on center.

3.02 EXAMINATION

A. Examine substrates and conditions for compliance with manufacturer requirements for installation conditions affecting performance of the work.
   1. Do not proceed with installation until unsatisfactory conditions have been corrected.
   2. Ensure weather-resistant barrier (WRB) is installed prior to installing attachment system.
   3. Ensure fenestration, transitions, discontinuities, sills, and ledgers are flashed and sealed to move moisture to the exterior of the building.

B. Field verify architectural details and mechanical and electrical requirements prior to commencing installation.

C. Commencement of installation constitutes acceptance of existing conditions and acceptance of responsibility for satisfactory performance.

3.03 ATTACHMENT SYSTEM INSTALLATION

A. Preparation: Review areas of potential interference and conflicts and coordinate layout and support provisions for interfacing work.

B. Installation: Install in strict accordance with manufacturer’s installation instructions.

C. Primary Girts:
   1. Locate stud framing for stud walls.
   2. Attach girts at 16 inch on center on support wall (at each stud location).
      a. Tighten screws to substructure to a snug tight condition and not stripped. Do not over-torque beyond manufacturer’s recommendation. If installed using hand tools, verify for each installer at beginning of project using snug-tight criteria. Do not use stripped holes.
   3. Thermally isolate wall bracket attachments by sandwiching thermal isolation material between metal girt and support wall substrate.

4. Thermally isolate wall anchor fastener using material to thermally isolate fastener heads from metal bracket.
5. Mineral Fiber Insulation: Install to expand into and friction fit between girts as specified by Section 072100 prior to installing horizontal rails.
6. Establish and re-establish and restart girt locations using laser or chalk-line at fenestrations and other obstructions to establish horizontal alignments.

D. Touch-up shop-applied protective coatings damaged during handling and installation.
E. Use shearing instruments (i.e. snips, nibbler, etc.) for cutting metal framing components. Saws are not recommended, as the sparks produced during cutting will damage the anti-corrosion coating. If sparks are generated during cutting, be sure the portion of the component to be installed on the building is protected from sparks and that any stockpile near the cutting station is also protected.
F. The systems components should not be cut while installed on the building, unless using a shearing instrument.
G. Replace thermal isolator pieces that break during installation.
H. Provide a 3/8" – 1/2" gap between girts for expansion when multiple lengths of rail are installed.
I. Minimum length of installed cut primary rail is 12" and must be attached to at least two separate wall brackets to prevent rotation of rail. Unsupported cantilever must not exceed 6" unless specified differently by manufacturer's engineer.

3.04 ERECTION TOLERANCES

A. Maximum Framing Member Variation from True Position: 1/4 inch.
B. Maximum Framing Member Variation from Plane:
   1. Individual Framing Members: Do not exceed 1/4 inch in 10 foot.
   2. Accumulative Over-all Variation for Wall and Floor System: Do not exceed 1/4 inch.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Technical Service: Make intermittent and final inspection to verify installation in conformance to manufacturer instructions and suitable as framing assembly for subsequent metal panels, acrylic plastering, and other cladding installations.
   1. Confirm snug tight and fastener sizing.
   2. Confirm framing members installed in correct orientation and maximum spacing.

3.06 ADJUSTING

A. Inspect and adjust after installation. Replace or repair defective work.
B. Adjust, and reconfigure as necessary to accommodate cladding systems for installations over work of this Section. Do not reuse pre-drilled holes unless fastener size is increased.

END OF SECTION 07 48 00

SECTION 07-5216 – (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Substrates
      a. Concrete Decks
   2. Styrene-butadiene-styrene (SBS)-modified bituminous membrane roofing.
   3. Hybrid roofing system that combines built-up ply sheets with styrene-butadiene-styrene (SBS)-modified bituminous cap sheet.
   4. Substrate board.
   5. Vapor retarder.
   6. Roof insulation.
   7. Cover board.
   8. Walkways.

B. Products installed but not furnished under this section
   1. Sheet Metal Flashing and Trim.
   2. Sheet Metal Roofing Specialties.

C. Related Requirements:
   1. Division 05 Section - Steel Decks.
   2. Section 06 10 00 "Rough Carpentry" for wood nailers, curbs, and blocking, and for wood-based, structural-use roof deck panels.
   3. Section 06 16 00 "Sheathing" for wood-based, structural-use roof deck panels.
   4. Section 07 21 00 "Thermal Insulation" for insulation beneath the roof deck.
   5. Section 07 62 00 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
   6. Division 07 Section - Roof Accessories.
   7. Section 07 92 00 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.03 REFERENCE STANDARDS

A. References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.
   1. ASTM - American Society for Testing and Materials, Philadelphia, PA.
   2. FM - Factory Mutual Engineering and Research, Norwood, MA.
   3. NRCA - National Roofing Contractors Association, Rosemont, IL.
   4. OSHA - Occupational Safety and Health Administration, Washington, DC.
   5. SMACNA - Sheet Metal and Air Conditioning Contractors National Association, Chantilly, VA
   6. UL - Underwriters Laboratories, Northbook. IL

1.04 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.05 DESCRIPTION OF WORK

A. The basic work description required in this specification are referenced below:
   1. Roofing Type: Two ply SBS modified bitumen roof system. Johns Manville Specification 2FID or equal by approved manufacturer.
   2. Deck: As indicated on drawings and herein.
   3. Slope: 1/4 inch.
   4. Substrate board: Rigid Gypsum or Perlite Board as specified.
   5. Vapor Retarder: As indicated.
   6. Insulation - Bottom Layer: Polyisocyanurate or Polystyrene as specified, at thickness as indicated on drawings and herein, mechanically attached with tapered insulation system as indicated on the drawings.
   7. Cover Board - Top Layer: High density fiberboard, perlite board or other rigid board as specified, having a minimum thickness of 3/4 inches, applied in hot asphalt. Provide tappered system as indicated.
   8. Roof System Membranes:
      a. Base Sheet: ASTM D-6163, Type I, Grade S., applied in ASTM D-312 Type IV asphalt. Johns Manville Dynabase or comparable product by other approved manufacturer.
      b. Highly Reflective Cap Sheet: ASTM D-6163, Type I, Grade G, applied in D-312 Type IV asphalt. Johns Manville DynaGlas FR CR, or comparable product by other approved manufacturer.
   9. Flashing System Membrane:
      a. Hot mop applied, ASTM D-6163, Type I, Grade G. Highly reflective SBS cap sheet to match the field membrane. Mechanically fastened base sheet per Manufacturers recommendations where required. Johns Manville DynaWeld Cap FR CR, or comparable product by other approved manufacturer.
      b. Where required for roof warranty, use liquid applied membrane flashing at roof penetrations and any existing openings with less than 8 inch vertical rise above the new roofing surface.
      c. Roofing manufacturers approved, non-reflective, base flashing system at repair to existing locations as required for roof warranty.

1.06 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
   1. Tour, inspect, and discuss existing conditions.
      a. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
      b. Review structural loading limitations of roof deck during and after roofing.
   2. Review project specifications and their requirements.
   3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
   4. Review special flashing and installation details.
   5. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   6. Review manufacturer's inspection requirements and forms.
   7. Review required submittals, both completed and yet to be completed.
   8. Review coordination of roof penetrations.
   9. Review required inspections, testing, certifying, and material usage accounting procedures.
   10. Review base flashings, special roofing details, roof drainage, equipment curbs, and condition of other construction that affects roofing system.
   11. Review governing regulations and requirements for insurance and certificates if applicable.

12. Review temporary protection requirements for roofing system during and after installation.
13. Review roof observation and repair procedures after roofing installation.

B. Review checklist items, including but not limited to:
1. Base flashings shall extend a minimum 8 inch height from finished membrane. Verify curb heights for all new equipment have been coordinated.
2. Counter flashings on A/C, ventilators, and other roof top equipment shall have soldered corners, and curb size shall be coordinated with equipment submittals.
3. Thru-wall scuppers and escutcheon plates shall be soldered and sealed entirely at face of building. Discuss leader box overflow requirements.
4. Pipe support requirements.
5. All equipment and supports resting on roof membrane require roof pads.
6. All trades to provide protection board at their work areas, and storage on roof when works occurring after roofing operations are complete cannot be avoided. All trades required to keep their work area clean and roof surface clear of their screws and other potentially damaging hardware, equipment, and debris.
7. Metal workers and base flashings shall not damage completed roof membranes.
8. No penetrations through base flashings. No penetrations through top side of roof curb flashing caps.
9. Sealant filled hooded pans required at all small pipe penetrations.
10. Refrigerant line penetrations (peel back insulation first, then seal, then replace insulation).
11. Cutting oils, refrigerant oils, soldering, etc. above roof will cause concern. Discuss plans to address concerns and protect roofing.
12. Keep through-wall flashings below weep vents where roofing abuts brick veneer walls.
13. Where roofing extends to bottom of windows in walls above adjacent roofing, solder and seal any flashing joints. No exposed fasteners or penetrations in sill flashings or counter flashings.
14. Overflow drains shall be 2 inches above primary roof drain elevation, unless noted otherwise.
15. Ponding water 48-hrs after rain event shall be evidence of improper slope. Contractor shall provide tapered insulation and install membrane laps in manner to prevent ponding.
16. Dirt legs at gas lines shall have 1" minimum clearance from finished roof membrane.
17. Plumbing stack lead flashings shall turn inside a minimum 1" distance.
18. Provide splash blocks or pans where one roof drains to another roof surface.
19. Exposed wood blocks shall not be permitted on top of roofing membrane unless specifically indicated in Drawings.
20. All roof penetrations shall be a minimum 2-0 inches (or other distance as required by Contract Documents, or as required by roofing Manufacturer) away from other roof penetrations, from roof edges, or from parapet walls, whichever distance is greatest in each case.
21. Supports for roof ladders must not penetrate base flashings or copings. For back side of parapet walls not otherwise detailed in Drawings, install metal roof panel with treated blocking behind panel (to prevent crushing of wall panel); lag bolt ladder through metal panel to blocking inside of wall. Seal & gasket fastener penetrations.
22. Clamping rings at drains shall be tightened after installation.
23. Adhere to Manufacturers' recommendations for fastener spacing.
24. Avoid stepping of through-wall flashings and base flashings to maximum extent possible.
25. Provide lining at pipe support clamps to prevent corrosion between dissimilar metals.
26. All exposed gas piping to be painted per painting specifications.
27. Rise wall flashings must not cover weeps at any exterior finish materials.
28. Screws through decking shall not be visible at exposed deck at either the interior of the building or at exterior canopies.
29. Electrical wiring shall be installed within equipment curbs and other construction to maximum extent possible. Where penetrations are unavoidable, provide liquid scrim flashing system on 12 inches vertical hard pipe with gooseneck, for threaded UV resistant flex conduit attachment.

30. Condensate shall be installed within equipment curbs where possible, unless otherwise indicated. Where copper condensate is shown to be used above roof, paint it to match gas piping.
31. Coordination of lightning protection penetrations and attachment details with roof warranty requirements.
32. Final roof inspections will include acceptance from the manufacturer, the General Contractor, the roofing contractor / installer, the Architect, and Owner, prior to final payment.

C. Roofing Conferences: Allow for two additional roofing conferences to be called for as deemed necessary by the Architect; one being a conference for final inspection & project wrap-up.

1.07 ACTION SUBMITTALS

A. Product Data: For each type of product.
1. For products from other than the basis of design manufacturer, submit complete comparison of properties to the basis of design products.
2. Submit Manufacturer's Product Safety Data Sheets for each product.

B. Shop Drawings: Include plans, sections, details, and attachments to other work, including but not necessarily limited to the following:
1. Layout and thickness of insulation and cover boards.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tapered insulation, including slopes. Tapered insulation shown in Drawings is diagrammatic. All tapered insulation required to prevent ponding as defined by the roofing Manufacturer's warranty requirements is a part of the base scope of this contract. Include crickets at all mechanical curbs and similar obstructions to water flow, whether or not such crickets are specifically indicated in the Drawings.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Crickets, saddles, and tapered edge strips, including slopes.
7. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
8. Tie-in with adjoining air barrier.

C. Samples for Verification: For the following products:
1. Selection Samples of manufacturer's standard colors for Cap Sheet and Flashing color selection by Architect.
2. Manufacturer's standard sample size roofing membranes and cap sheet
3. Manufacturer's standard sample size cover board
4. Manufacturer's standard sample size of roof insulation
5. Manufacturer's standard substrate board sample
6. Manufacturer's standard vapor retarder sample
7. Walkway Pads or Rolls: Samples of manufacturer's standard colors for selection by Architect.

D. Wind Uplift Resistance Submittal: For roofing system indicating compliance with wind uplift performance requirements.

1.08 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Manufacturer Certificates:
1. Submit certification that materials meet ASTM, federal, local code, and performance specifications, and that materials furnished are compatible for deck indicated each one to the other and to adjacent related work. Certificates shall be from the material manufacturer. Certificates from suppliers or wholesalers will not be acceptable.
2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Submit Test Reports indicating that roof materials comply with minimum solar reflectance index requirements noted in performance requirements.

D. Evaluation Reports: For components of membrane roofing system, from ICC-ES.

E. Field Test Reports:
   1. Concrete internal relative humidity test reports.
   2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

F. Field quality-control reports.

G. Sample Warranties: For manufacturer's special warranties.

1.09 CLOSEOUT SUBMITTALS

A. Manufacturer's printed recommendations for proper maintenance of the specified roof system including inspection frequencies, penetration addition policies, temporary repairs and leak call procedures.

B. Signed and fully actuated warranties.

C. Installer's Guarantee contact information and leak call procedures.

D. Submit site visit reports from Manufacturer's representative.

E. Include all changes to plans, details, and specifications, as well as all RFI's, ASI's, and Change Orders related to roofing in project Record Documents (Record Drawings and O & M's).

1.10 QUALITY ASSURANCE

A. Manufacturer Qualifications: Primary roofing products, including each type of sheet, all manufactured in the United States, shall be supplied by a single manufacturer which has been successfully producing the specified types of primary products for not less than 10 years. The primary roofing products shall have maintained a consistent composition for a minimum of five years.
   1. Ensure that the primary roofing materials manufacturer provides direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conducts a final inspection upon successful completion of the project.
   2. The roofing system product supplier shall furnish the Roofing Contractor with Material Safety Data Sheet/Sheets (MSDS), incorporating OHSA approved form, current edition. Said sheets shall be available at the site at all times until project completion. A copy shall be included in the project closeout documentation.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
   1. Contractor shall have a minimum of 5 years experience in successfully installing the same or similar roofing materials and be certified in writing by the roofing materials manufacturer to install the primary roofing products.

C. Product Quality Assurance Program: Primary roofing materials shall be manufactured under a quality management system that is monitored regularly by a third party auditor under the ISO 9001:2000 or equivalent audit process.

D. Scope of Work: The work to be performed under this specification shall include but is not limited to the following: Attend necessary job meetings and furnish competent and full time supervision, experienced roof mechanics, all materials, tools and equipment necessary to complete, in an acceptable manner, the roof installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of the primary roofing products. In addition, application practice shall comply with requirements and recommendations contained in the latest edition of the Handbook of Accepted Roofing

Knowledge (HARK) as published by the National Roofing Contractors Association, amended to include the acceptance of a phased roof system installation.

E. Local Regulations: Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction.

F. Testing and Verification:
   1. Owner retains the right, at Owner's option, to sample all roofing products on site for testing by an accredited laboratory without advance notice or additional cost to Owner to patch test samples.
   2. Owner may, at Owner's option, select and employ at Owner's expense:
      a. A roofing systems Consultant to review the Construction Documents and/or perform surveillance during any installation of substrate, roofing, flashing and any other part of the total roofing system.
      b. An independent roofing inspection service specializing in performing Non Destructive Evaluation (NDE), for moisture detection purposes, before the final acceptance of the roofing or before the end of the roofing Guarantee Period.
   3. Prior to final acceptance, Contractor shall water test all roof drains. Architect and Program Manager shall be notified prior to conducting water tests.
   4. A representative of Owner, the Program Manager, the General Contractor, the Roofing Contractor and Roofing Manufacturer's technical representative shall review the roofing system toward the end of the warranty period and toward the end of the Roofing Contractor's guarantee period. The Roofing System Manufacturer's authorized technical representative shall inspect the roofing system near the close of the Manufacturer's warranty. The Roof System Manufacturer's representative within seven days of each site visit shall submit a written report to Owner.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
   1. Deliver materials in quantities required to allow continuity of application before beginning roofing operations.
   2. Deliver in packaging, or with certificate or bill of materials, bearing approved testing agency labels as required by code and authorities having jurisdiction.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
   1. Protect stored liquid material from direct sunlight.
   2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.
   1. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
   2. Store in a clean, flat and dry location.
   3. All material stored on the roof overnight shall be stored on pallets. Rolls of roofing must be stored on ends.
   4. Store materials on the roof in a manner so as to preclude overloading of deck and building structure.
   5. Store materials such as solvents, adhesives, and asphalt cutback products away from open flames, spark, or excessive heat.
   6. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.

D. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.

Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

E. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed and replaced at the Contractors expense.

1.12 FIELD CONDITIONS

A. Requirements Prior to Job Start
   1. Notification: Give a minimum of five (5) days notice to the Testing Lab and Manufacturer prior to commencing any work, and notify both parties on a daily basis of any change in work schedule.
   2. Permits: Obtain all permits required by local agencies and pay all fees which may be required for the performance of the work.
   3. Coordinate with other trades for all roofing preparation requirements, including but not limited to items listed in pre-installation meeting requirements and agenda.
   4. Coordinate all requirements for Manufacturer's full warranty of the roofing system, without exclusions. Should conflicts be discovered between Manufacturer's requirements and requirements of the Drawings and Specifications, generally the most restrictive requirement shall prevail. Notify Architect immediately upon discovery of conflicts. Contractor shall not be due additional compensation for correction of conditions required for roof warranty due to his failure to coordinate Manufacturer's requirements.

B. Environmental Requirements
   1. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
   2. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.
   3. Temperature Restrictions - asphalt: At ambient temperatures of 40° F and below, special precautions must be taken to ensure that the specified Type IV asphalt maintains a minimum acceptable 400°F at the point of sheet application. The asphalt must not be overheated to compensate for cold conditions. The use of insulated handling equipment is strongly recommended. Hot luggers, mop carts, and kettle-to-roof supply lines should be insulated. Hand mops should be constructed with a smaller yarn head to facilitate short moppings. Luggers and mop carts should never be more than half filled at all times.

C. Protection Requirements
   1. Membrane Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent surfaces throughout this project.
   2. Torch and Hot Work Safety (for work over Owner-occupied facilities): Designate one person on each crew to perform a daily fire watch. The designated crew member shall watch for fires or smoldering materials on all areas of roof construction. Continue the fire watch after roofing material application has been suspended for the day.
   3. Limited Access (for Partially-Occupied Sites): Erect temporary fencing or other barriers as required to prevent access by the public or Owner's personnel to areas where potentially hazardous materials, tools and equipment are located during the course of the project.
   4. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
   5. Site Condition: Complete, to the owners satisfaction, all job site clean-up including building interior, exterior, and landscaping where affected by the construction.

1.13 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, non-pro-rated and without monetary limitation, in which manufacturer agrees to 100 percent repair or replacement of

components of membrane roofing system that fail in materials or workmanship within specified warranty period.
1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, roof penetrations flashed with liquid flashing system, and any other components of membrane roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

B. Installer's Guarantee: Submit roofing Installer's Guarantee, on Guarantee form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system as required to maintain roof in water tight condition for the duration of the warranty period. Guarantee shall cover roofer's complete scope of work including metal flashings and copings for the following Guarantee period:

C. A fully executed Warranty and Guarantee, delivered to the Owner or included in project record documents in triplicate, and accepted by Owner, is a prerequisite for final Acceptance of the project by Owner.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
1. Accelerated Weathering: Roof membrane shall be tested to demonstrate physical integrity over the working life of the roof based upon it withstanding 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470. Hail resistance rating - VSH.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: The roof system, including attachment to deck and all components above deck (ie the roof assembly) shall be tested in compliance to FM Approvals 4474, UL 580, or UL 1897, and shall be Class 1-90.

D. Fire Classification: The system shall be identified and listed for the fire class as required by local code by an approved testing agency, tested in compliance with ASTM E 108 or UL 790.
1. Fire/Windstorm Classification: Class 1A-120.
2. **Hail-Resistance Rating: FM 1-34 VSH.**
3. Wind Uplift Load Capacity: 120 psf.

E. Energy Performance: Provide roofing system with initial Solar Reflectance Index (SRI) not less than 83, and 3-year aged SRI not less than 65, when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

F. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency.
1. Identify products with appropriate markings of applicable testing agency.

G. Jobsite Safety: Execute all operations and provide a safe work environment in accordance with OSHA standards and regulations.
1. Follow all industry, code, fire prevention guidelines and requirements for storage of materials, staging areas, roof access, and application means and methods.

2.02 MANUFACTURERS

A. Source Limitations: Obtain all components for roofing system from roof membrane manufacturer.

2.03 DESCRIPTION OF SYSTEM

A. Roofing Membrane Assembly: A roof membrane assembly consisting of two plies of a prefabricated, reinforced, homogenous Styrene-Butadiene-Styrene (SBS) block copolymer modified asphalt membrane, hot mop applied over a prepared substrate. Both reinforcement mats shall be impregnated/saturated and coated each side with an SBS modified bitumen blend. The roof system shall pass 500 cycles of ASTM D 5849 Resistance to Cyclic Joint Displacement (fatigue) at 14° F. Passing results shall show no signs of membrane cracking or interply delamination after 500 cycles. The roof system shall pass 200 cycles of ASTM D 5849 after heat conditioning performed in accordance with ASTM D 5147. The assembly shall possess waterproofing capability, such that a phased roof application, with only the modified bitumen base ply in place, can be achieved for prolonged periods of time without detriment to the watertight integrity of the entire roof system.

B. Basis-of-Design Product: The design for modified bitumen roofing is based on Johns Manville 2FID system with class A Fire Rating. Subject to compliance with requirements, provide the named products or comparable products by one of the following:
   1. Derbigum.
   2. GAF Materials Corporation.
   3. Siplast, Inc.
   4. Soprema.
   5. Other approved equal. Substitutions must be approved by Architect. See Division 1 specifications for requirements for proposed substitutions. Substitutions for convenience will only be considered within first 30 days after notice to proceed.

2.04 BASE SHEET MATERIALS

A. SBS-Modified Bitumen Fiberglass Mat Base Sheet: ASTM D6163/D6163M, Type I, Grade S, SBS-modified asphalt sheet, reinforced with fiberglass fabric, smooth surfaced, suitable for cold adhesive or hot asphalt application method.
   1. Basis of Design product - Johns Manville DynaBase.
      a. ASTM D-6163, Type I, Grade S.
      b. Thickness (avg.): 90 mils (ASTM D 5147).
      c. Weight (min per 100 sq. ft of coverage): 60 lb.
      d. Low temperature flexibility @ -10° F: PASS (ASTM D 5147).
      e. Dimensional Stability (max): 0.2 percent (ASTM D 5147).
      f. Approvals: UL Class listed, FM Approved (products shall bear seals of approval).
      g. Reinforcement: Fiberglass scrim/fiberglass mat or other meeting the performance and dimensional stability criteria.
   2. Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
      a. Derbigum
      b. GAF.
      c. Johns Manville; a Berkshire Hathaway company.
      d. Siplast.
      e. Soprema, Inc.
      f. Other approved equal. Substitutions must be approved by Architect. See Division 1 specifications for requirements for proposed substitutions. Substitutions for convenience will only be considered within first 30 days after notice to proceed.

2.05 STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS CAP SHEET

A. Granule-Surfaced Roofing Cap Sheet: ASTM D6163/D6163M, Type I, Grade G, SBS-modified asphalt sheet, reinforced with fiberglass fabric, high SRI granular surfaced; suitable for cold adhesive or hot asphalt application method.
   1. Basis of Design product - Johns Manville DynaGlas 30 FR CR
      a. ASTM D-6163, Type I, Grade G.
      b. Thickness (avg.): Minimum of 130 mils (ASTM D 5147).
      c. Weight (min per 100 ft square of coverage). 90 lb.
      d. Dimensional Stability (max): 0.2 percent (ASTM D 5147).
      e. Approvals: UL Class listed, FM Approved (products shall bear seals of approval).
      f. Reinforcement: Fiberglass mat or other meeting the performance and dimensional stability criteria.
      g. Surfacing: Ceramic or synthetic granules meeting minimum solar reflectance index requirements [**of 83 initial, 65 3-year aged**] [**as noted in Performance Requirements article of these specifications**] <**insert solar reflectance requirements**>.
   2. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Derbigum
      b. GAF
      c. Johns Manville
      d. Sipast
      e. Soprema, Inc.
      f. Other approved equal. Substitutions must be approved by Architect. See Division 1 specifications for requirements for proposed substitutions. Substitutions for convenience will only be considered within first 30 days after notice to proceed.

2.06 BASE FLASHING SHEET MATERIALS

A. Backer Sheet: **ASTM D6163/D6163M, Type I or II, Grade S, SBS-modified asphalt sheet, reinforced with glass fibers**, smooth surfaced, suitable for application method specified.

B. Granule-Surfaced Flashing Sheet: **ASTM D6163/D6163M, Type I, Grade G, SBS-modified asphalt sheet, reinforced with glass fibers**, granule surfaced, suitable for application method specified.
   1. Basis of Design product - Johns Manville Dyna Weld Cap FR CR
      a. ASTM D-6163, Type I, Grade G.
      b. Approvals: UL Approved, FM Approved (products shall bear seals of approval).
      c. Reinforcement: Fiberglass scrim mat or other meeting the performance and dimensional stability criteria.
      d. Surfacing: Ceramic or synthetic granules meeting minimum solar reflectance index requirement of 83 initial, 65 3-year aged.

2.07 AUXILIARY ROOFING MATERIALS

A. General: Roofing accessories and miscellaneous materials shall be approved in writing by roofing Manufacturer for use as part of the roofing assembly for this project, prior to installation.

B. Adhesives and Sealants:
   1. Mopping Asphalt: Type IV asphalt certified for full compliance with the requirements listed in Table I, ASTM D 312. Each container of bulk shipping ticket shall indicate the equiviscous temperature, EVT, the finished blowing temperature, FBT, and the flash point, FP. Mopping asphalt shall be approved in writing by the roof membrane manufacturer.
      a. Trumbull ASTM D-312, Type IV, or as approved by the primary roofing manufacturer.
   2. Bituminous Cutback Materials
      a. Primer: A high flash, quick drying, asphalt solvent blend which meets or exceeds ASTM D 41 requirements, as provided by the primary roofing manufacturer.

b. Mastics: An asphalt cutback mastic, reinforced with non-asbestos fibers, used as a base for setting metal flanges conforming to ASTM D 4586 Type II requirements, as provided by the primary roofing manufacturer.

3. Sealant: A moisture curing, non-slump elastomeric sealant designed for roofing applications. The sealant shall be approved by the roof membrane manufacturer for use in conjunction with the roof membrane materials.

C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

D. Roof Vents: As recommended by roof membrane manufacturer.
1. Size: Not less than 4-inch (100-mm) diameter.

E. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft. (0.16 kg/sq. m).

F. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

G. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.

H. Asphalt Bleed-out Masking:
1. Roofing Granules: Ceramic or synthetic granules of color scheme matching the granule surfacing of the finish ply, meeting minimum SRI index specified.
2. Use of coating as provided by primary roofing manufacturer, meeting minimum SRI index specified, requires specific approval by Architect. Coating is not an acceptable solution to repair roof membrane soiled by construction activities, unless specifically approved by Architect. Architect reserves right to reject a coating as equal installation to granules in any and all cases.

I. Perlite Cant Strips: A cant strip composed of expanded volcanic minerals combined with waterproofing binders. The top surface shall be pre-treated with an asphalt base coating. The face of the cant shall have a nominal 4 inch dimension.

J. Expansion Joints: Provide factory fabricated weatherproof exterior covers for expansion joint openings as detailed in the Drawings and as required by roofing Manufacturer for complete installation.

K. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

L. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 (2.36-mm) sieve and 98 percent of mass retained on No. 40 (0.425-mm) sieve; color to match roof membrane.

M. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

2.08 ROOF INSULATION

A. General: Rigid Roof Insulation shall be UL and FM approved. Insulation shall be approved in writing by the insulation manufacturer for intended use and for use with the specified roof assembly. Maintain a minimum panel size of 4 feet by 4 feet where insulation is specified to be installed in hot asphalt.

B. Polyisocyanurate Board Insulation: A closed cell flat and tappered, rigid polyisocyanurate foam core material, integrally laminated between glass fiber facers, in full compliance with ASTM C1289, , Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.
1. Flat insulation Panels shall have a nominal thickness to achieve a minimum Long Term aged Thermal Resistance R30 value per ASTM C1289-13e1. Provide tappered panels as required for slopes indicated.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. ACFoam II by Atlas Energy Products; Atlanta, GA
    b. ENRGY 3 by Johns Manville, Inc.; Denver, CO.
    c. EnergyGuard by GAF, Gainesville, TX
    d. H-Shield by Hunter Panels, LLC; Portland, ME.
    e. Multi-Max FA by RMAX, Inc.; Dallas, TX.
    f. Paratherm by Siplast/Icopal; Irving, TX.
3. Compressive Strength: **25 psi (172 kPa)**.
4. Size: **48 by 48 inches (1219 by 1219 mm)**.

C. Tapered Insulation: Provide factory-tapered insulation boards.
1. Material: **Match roof insulation**.
2. Minimum Thickness: 1/4 inch (6 mm).
3. Slope:
    a. Roof Field: 1/4 inch per foot (1:48) unless otherwise indicated on Drawings.
    b. Saddles and Crickets: 1/2 inch per foot (1:24) unless otherwise indicated on Drawings.

2.09 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
1. The insulation fasteners shall provide attachment required to meet the specified uplift performance and to restrain the insulation panels against the potential for ridging.
2. The fastening pattern for each insulation panel to be used shall be as recommended by the insulation manufacturer and approved by the manufacturer of the primary roofing products.
3. Acceptable insulation fastener manufacturers for specific deck types are listed below.
    a. Base Sheet Fasteners for Lightweight Concrete Decks: Twin-legged expanding base sheet fasteners. Manufactured from G-90 galvanized steel and coated with a fluoropolymer coating which meets the Factory Mutual Approval Standard #4470. Leg length shall be 1.7 inches for lightweight concrete decks and 1.2 inches for gypsum roof decks. Integral disc is a 2 3/4 inches diameter Galvalume®plate. Johns Manville LWC CR Base Ply Fasteners or comparable product by other approved manufacturer.
    b. Metal Decks: Insulation mechanical fasteners for metal decks shall be factory coated for corrosion resistance. The fasteners shall meet or exceed Factory Mutual Standard FMG 4470, and when subjected to 30 Kesternich cycles, show less than 15 percent red rust. Designed for fastening roof insulation to substrate, and provided or approved by primary roofing system Manufacturer.
        1) A fluorocarbon coated screw type roofing fastener having a minimum 0.220 inch thread diameter. Plates used in conjunction with the fastener shall be a metal type having a minimum 3 inch diameter as supplied by the fastener manufacturer.
        2) As provided or approved by the primary roofing Manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer to achieve required uplift resistance and for adhering insulation to substrate and conditions uncovered by roof tear-off.

D. Insulation Cant Strips: ASTM C728, perlite insulation board.

E. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

F. Wood Nailer Strips: Comply with requirements in Section 06 10 00 "Rough Carpentry."

G. Tapered Edge Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

H. Cover Board: ASTM C208, Type II, Grade 2, cellulosic-fiber insulation board, 1/2 inch (13 mm) thick.
   1. A high density panel composed of interlocking wood fibers and waterproofing binders, having a top surface that is pre-treated with an asphalt based coating (water absorption - 7 percent volume maximum).
   2. Acceptable types are as follows:
      a. Johns Manville 3/4 inches Fesco Board.
      b. Siplast Wood Fiberboard by Siplast/Icopal; Irving, TX.
      c. High Density Fiberboard by the Celotex Corp.; Tampa, FL.
      d. Structodeck by Wood Fiber Industries; Chicago, IL.
      e. Fiber Base by Temple-Inland Forest Products Corporation; Diboli, TX.
      f. High Density Roof Insulation by Huebert Fiberboard, Inc.; Boonville, MO.
   3. Cover Board - Perlite: As an alternate and when required by the primary roofing manufacturer for a single source warranty, perlite board meeting ASTM D-728. 3/4 inch thickness.

2.10 ASPHALT MATERIALS

A. Asphalt Primer: ASTM D41/D41M.

B. Roofing Asphalt: ASTM D312/D312M, Type III or IV as recommended by roofing system manufacturer for application.

2.11 WALKWAYS

A. Walktread: A prefabricated, puncture resistant polyester core reinforced, polymer modified bitumen sheet material topped with a ceramic-coated or synthetic granule wearing surface as provided by the primary roofing Manufacturer. Johns Manville DynaTred Plus or comparable product by other approved manufacturer.
   1. Where available from roofing Manufacturer, use product matching cap sheet finish or with SRI 83 or greater.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
   1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
   2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
   4. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 <**Insert value**> percent, or as recommended by roofing system manufacturer, when tested according to ASTM F2170.
      a. Test Frequency: One test probe per each 1000 sq. ft. (93 s2. m) or portion thereof, of roof deck, with not less than three test probes.
      b. Submit test reports within 24 hours of performing tests.
   5. Verify that concrete-curing compounds that impair adhesion of roofing components to roof deck have been removed.
   6. Verify that joints in precast concrete roof decks have been grouted flush with top of concrete.

3.02 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions.
   1. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.
   1. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m), and allow primer to dry.

3.03 INSTALLATION OF ROOFING, GEN ERAL

A. Install roofing system according to roofing system manufacturer's written instructions, [**FM Approvals' RoofNav listed roof**] [**SPRI's Directory of Roof Assemblies listed roof**] assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast.
   1. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified in Section 07 27 13 "Modified Bituminous Sheet Air Barriers."

D. Asphalt Heating:
   1. Heat asphalt to its equiviscous temperature, measured at the mop cart or mechanical spreader immediately before application.
      a. For cap sheets, heat asphalt according to cap sheet manufacturer's recommendations.
   2. Circulate asphalt during heating.
   3. Do not raise asphalt temperature above equiviscous temperature range more than one hour before time of application.
      a. For cap sheets, comply with cap sheet manufacturer's recommendations.
   4. Do not exceed asphalt manufacturer's recommended temperature limits during asphalt heating. Contractor shall monitor and maintain a record available for review if required by Owner or Manufacturer's representative.
   5. If the EVT information is not provided, the following asphalt temperature shall be observed. Maximum heating temperature shall be 525° F. Minimum application temperature shall be 450° F.
   6. Do not heat asphalt within 25 degree F (14 degree C) of flash point.
   7. Discard asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.
   8. Asphalt Moppings: Ensure that all moppings do not exceed a maximum of 25 lb/sq. Mopping shall be total in coverage, leaving no breaks or voids.
   9. Bitumen Consistency: Cutting or alterations of bitumen, primer, and sealants will not be permitted.
   10. Apply hot roofing asphalt within plus or minus 25 degree F (14 degree C) of equiviscous temperature.
      a. For cap sheets, comply with cap sheet manufacturer's recommendations.

E. Asphalt Heating: Heat and apply SEBS-modified roofing asphalt according to roofing system manufacturer's written instructions. Kettles and tankers shall be equipped with accurate, fully readable thermometers

F. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.04 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 45 degree F (14 degree C).

D. Installation Over Concrete Decks:
   1. Install base layer of insulation with joints staggered not less than 24 inches (600 mm) in adjacent rows.
      a. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
      b. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches (600 mm).
         1) Trim insulation, so that water flow is unrestricted.
      c. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
      d. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
      e. Adhere base layer of insulation to concrete roof deck according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
         1) Prime surface of concrete deck with asphalt primer at rate of 3/4 gal./100 sq. ft. (0.3 L/sq. m), and allow primer to dry.
         2) Set insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 degree F (14 degree C) of equiviscous temperature.
   2. Install upper layers of insulation and tapered insulation, with joints of each layer offset not less than 12 inches (300 mm) from previous layer of insulation.
      a. Staggered end joints within each layer not less than 24 inches (600 mm) in adjacent rows.
      b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
      c. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
      d. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches (600 mm).
         1) Trim insulation, so that water flow is unrestricted.
      e. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
      f. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
      g. Adhere each layer of insulation to substrate using adhesive according to and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
         1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 degree F (14 degree C) of equiviscous temperature.

3.05 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines, with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction.
   1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   2. At internal roof drains, conform to slope of drain sump.
      a. Trim cover board, so that water flow is unrestricted.
   3. Cut and fit cover board tight to nailers, projections, and penetrations.
   4. Adhere cover board to substrate using adhesive according to and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
      a. Set cover board in a solid mopping of hot roofing asphalt, applied within plus or minus 25 degree F (14 degree C) of equiviscous temperature.

B. Install sheathing paper over cover board and immediately beneath roof membrane.

3.06 INSTALLATION OF ROOFING MEMBRANE, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing" and the following requirements.

1. Base sheet shall be inspected by roofing Manufacturers representative **[and Dallas ISD's roofing specialist] [and roofing consultant]**, prior to application of cap sheet.
2. Schedule required inspections prior to beginning roofing Work.
3. Take precautions to prevent materials from entering or clogging roof drains, scuppers, pipes, or other similar devices. Remove roof drain and scupper plugs or covers when no work is taking place or when rain is forecast.

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

C. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
2. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

D. Aesthetic Considerations and Patching: An aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques, apply the specified materials including granules and exercise care in ensuring that the finished application is acceptable to the Owner.
1. Finished application should contain no wrinkles, creases, fishmouths, sagging of base flashings, or other visible imperfections.
2. Bleed-out of asphalt fully masked to consistent appearance and conforming with SRI requirements.
3. Excessive patching in new roof areas will require removal and replacement if, in the opinion of the Architect, aesthetic quality is compromised.
4. Excessive patching in new roof areas will require removal and replacement if, in the opinion of the Manufacturer's representative, the amount of patching is to the extent that it is no longer qualified as a new roof or would affect roof warranty.

E. Priming: Prime metal and concrete and masonry surfaces with a uniform coating of the specified asphalt primer.

3.07 INSTALLATION OF BASE SHEET

A. Before installing, unroll base sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature.

B. Roofing Application: Apply all layers of roofing free of wrinkles, creases or fishmouths. Exert sufficient pressure on the roll during application to ensure prevention of air pockets.
1. Apply all layers of roofing perpendicular to the slope of the deck.
2. Fully bond the base ply to the prepared substrate, utilizing minimum 3 inch side laps and minimum 12 inch end laps. Apply each sheet directly behind the asphalt applicator. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger end laps a minimum of 3 feet.
3. Fully bond the finish ply to the base ply, utilizing minimum 3 inch side and end laps. Apply each sheet directly behind the asphalt or torch applicator. Stagger end laps of the finish ply a minimum 3 feet. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger side laps of the finish ply a minimum 12 inches from side laps in the underlying base ply. Stagger end laps of the finish ply a minimum 3 feet from end laps on the underlying base ply.
4. Maximum sheet lengths and special fastening of the specified roof membrane system may be required at various slope increments where the roof deck slope exceeds 1/2 inch per

foot. The manufacturer shall provide acceptable sheet lengths and the required fastening schedule for all roofing sheet applications to applicable roof slopes.

C. Installation of SBS-Modified Fiberglass-Mat Base Sheet:
   1. Install base sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
   2. Extend roofing sheets over and terminate above cants.
   3. Install base sheet in a shingle fashion.
   4. Adhere to substrate in a uniform coating of cold-applied adhesive.
   5. Install base sheet without wrinkles, rears, and free from air pockets.
   6. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
      a. Lap side laps as recommended by roof membrane manufacturer but not less than 3 inches (76 mm).
      b. Lap end laps as recommended by roof membrane manufacturer but not less than 12 inches (300 mm).
      c. Stagger end laps not less than 18 inches (450 mm).
      d. Heat weld end laps, leaving no voids.
      e. Roll laps with a 20-pound (9-kg) roller.
   7. Repair tears and voids in laps and lapped seams not completely sealed.
   8. Apply pressure to the body of the base sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.

3.08 INSTALLATION OF SBS-MODIFIED BITUMINOUS CAP SHEET

A. Before installing, unroll cap sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature at which cap sheet will be installed.

B. Install modified bituminous roofing cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
   1. Extend cap sheet over and terminate above cants.
   2. Install cap sheet in a shingle fashion.
   3. Install cap sheet as follows:
      a. Adhere to substrate in a solid mopping of hot roofing asphalt applied at asphalt temperature recommended by cap sheet manufacturer.
   4. Install cap sheet without wrinkles or tears, and free from air pockets.
   5. Install cap sheet, so side and end laps shed water.

C. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
   1. Lap side laps as recommended by roof membrane manufacturer but not less than 3 inches (76 mm).
   2. Lap end laps as recommended by roof membrane manufacturer but not less than 12 inches (300 mm).
   3. Stagger end laps not less than 18 inches (450 mm).
   4. [**Heat weld laps**] [**Completely bond and seal laps**], leaving no voids.
   5. Roll laps with a 20-pound (9-kg) roller.
   6. Repair tears and voids in laps and lapped seams not completely sealed.

D. Apply pressure to the body of the cap sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.

E. Granule Embedment: Broadcast granules over all bitumen overruns on the finish ply surface, while the bitumen is still hot or the adhesive is soft, to ensure a monolithic surface color, compliant with SRI index requirements.

3.09 INSTALLATION OF FLASHING AND STRIPPING

A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
   1. Prime substrates with asphalt primer if required by roofing system manufacturer.
   2. Backer Sheet Application:
      a. Adhere backer sheet over roofing membrane at cants in a solid mopping of hot roofing asphalt.

B. Backer Sheet Application:
   1. Adhere backer sheet to substrate in a solid mopping of hot roofing asphalt.

C. Flashing Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt applied at asphalt temperature recommended by flashing sheet manufacturer. Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer.

D. Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above roofing membrane and 4 inches (100 mm) onto field of roofing membrane.

E. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

F. Install liquid flashing system according to manufacturer's recommendations.
   1. Extend liquid flashing not less than 3 inches (76 mm) in all directions from edges of item being flashed.
   2. Embed granules, matching color of roof membrane, into wet compound.

G. Install roofing cap-sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.
   1. Cover lead flashing with roofing cap-sheet stripping, and extend a minimum of **6 inches (150 mm)** beyond edge of metal flashing onto field of roofing membrane.
   2. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
   3. Install stripping according to roofing system manufacturer's written instructions.

H. Parapet Wall Flashing Application - Masonry Surfaces: Flash masonry parapet walls and curbs using the reinforcing sheet and the flashing membrane. After the base ply has been applied to the top of the cant, fully adhere the reinforcing sheet, utilizing minimum 3 inch side laps and extend a minimum of 3 inches onto the base ply surface and 3 inches up the parapet wall above the cant. After the final roofing ply has been applied to the top of the cant, prepare the surface area that is to receive flashing coverage by by application of asphalt primer; allowing primer to dry thoroughly. Hot mop apply the flashing membrane into place using three foot widths (cut off the end of roll) always lapping the factory selvage edge. Stagger the laps of the flashing layer from lap seams in the reinforcing layer. Extend the flashing sheet a minimum of 4 inches beyond the toe of the cant onto the prepared surface of the finished roof and up the wall to the desired flashing height. Exert pressure on the flashing sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets. Check and seal all lose laps and edges. Nail the top edge of the flashing on 9 inch centers. Mechanically fasten membranes at parapets walls as recommended by roofing Manufacturer.

I. Water Cut-Off: At end of days work, or when precipitation is imminent, construct a water cutoff at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.

3.10 ROOF SYSTEM INTERFACE WITH RELATED COMPONENTS

A. Edge Metal: Completely prime metal flanges and allow to dry prior to installation. Turn the base ply down 2 inches past the roof edge and over the nailer. After the base ply and continuous cleat (if applicable) have been installed, set the flange in mastic and stagger nail every 3 inches on center. Strip-in the flange using the stripping-ply material, extending a

minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the gravel-stop rise of the edge metal. See item: Sealant, for finish of this detail.

B. Lead Pipe Flashings: Completely prime the lead flanges and allow to dry prior to installation. After the base ply has been applied, set the flange in mastic and strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the flange-sleeve juncture of the pipe flashing. See item: Sealant, for finish of this detail.

C. Lead Drain Flashings: Completely prime the lead drain flashing and allow to dry prior to installation. After the base ply has been applied, set the lead flashing sheet in mastic and form to turn down inside of the drain bowl. Ply-in the perimeter of the lead flashing using an additional layer of the base ply material, overlapping the perimeter of the lead a minimum of 4 inches. Terminate the finish ply to extend beneath the clamping ring seal. Install the clamping ring with all bolts in place.

D. Light Air Unit Supports: Where existing light air handing units or other equipment that are supported by wood sleepers (not supported by a roof curb) are to be removed and reinstalled, separate wood sleepers from the new roof assembly using the manufacturers walktread-roof protection material. Cut each walktread pad to a size which extends a minimum of 2 inches beyond the perimeter of each sleeper block. Set the walktread pad dry over the new assembly. Set each sleeper block dry over the walktread pad.

E. Metal Pipe Flashings: Completely prime the metal pipe flanges and allow to dry prior to installation. After the base ply has been applied, set the flanges in mastic and strip-in the flange using the stripping-ply material, extending a minimum of 4 inches beyond the edge of the flange. Terminate the finish ply at the flange-sleeve juncture of the pipe flashing. Install a watertight umbrella to the penetration, completely covering the opening of the pipe flashing. See Item: Sealant, for finish of this detail.

F. Sealant: Apply a smooth continuous bead of the specified sealant at the exposed finish ply edge transition to metal flashings incorporated into the roof system.

3.11 INSTALLATION OF WALKWAYS

A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size, according to walkway pad manufacturer's written instructions.
   1. When not precut, cut the walktread material into maximum 5 foot lengths and allow to relax until flat.
   2. Adhere the sheet in a full bed of Manufacturers approved plastic cement.
   3. Walk-in each sheet after application to ensure proper adhesion. Use a minimum spacing of 2 inches between sheets to allow for proper drainage.
   4. Install walkways at the following locations:
      a. Between each roof hatch and rooftop access.
      b. Top and bottom of each roof access ladder.
      c. Locations indicated on Drawings.
      d. Install all walktreads and pads so as not to cause water to pond.
      e. As required by roof membrane manufacturer's warranty requirements.
   5. Provide 3-inch (76-mm) clearance between adjoining pads.
   6. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.

B. Perform the following tests:
   1. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D5957, after completing roofing and flashing but before overlying construction is

placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
   a. Perform tests before overlying construction is placed.
   b. Flood to an average depth of 2-1/2 inches (65 mm) with a minimum depth of 1 inch (25 mm) and not exceeding a depth of 4 inches (100 mm). Maintain 2 inches (51 mm) of clearance from top of base flashing.
   c. Flood each area for 24 hours.
   d. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.
      1) Cost of retesting is the responsibility of the Contractor.
   e. Testing agency shall prepare survey report indicating locations of initial leaks, if any, and final survey report.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
   1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

D. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters. Provide one copy of the punchlist to the Architect.

E. Complete all punch list items. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
   1. Issuance of the Warranty: Complete all post-installation procedures and meet the Manufacturers requirements for final endorsement for issuance of the specified warranty.

F. Roofing system will be considered defective if it does not pass tests and inspections.
   1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.13 PROTECTING AND CLEANING

A. Site Conditions: Remove all screws, fasteners, and miscellaneous debris from completed roof. Leave all areas around job site free of debris, roofing materials, equipment, and related items after completion of job. Clean or repair any soiled roofing areas as required by Manufacturer for warranty requirements and to restore solar reflectance.

B. Protect roofing system from damage and wear during remainder of construction period.
   1. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

C. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

D. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.14 ROOFING INSTALLER'S GUARANTEE

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
   1. Owner: <**Insert name of Owner**>.
   2. Address: <**Insert address**>.
   3. Building Name/Type: <**Insert information**>.
   4. Address: <**Insert address**>.
   5. Area of Work: <**Insert information**>.

6. Acceptance Date: _____.
7. Guarantee Period: <**Insert time**>.
8. Expiration Date: _____.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Guarantee Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Guarantee Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Guarantee is made subject to the following terms and conditions:
   1. Specifically excluded from this Guarantee are damages to work and other parts of the building, and to building contents, caused by:
      a. lightning;
      b. peak gust wind speed exceeding _____;
      c. fire;
      d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
      e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
      f. vapor condensation on bottom of roofing; and
      g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
   2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
   3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
   4. During Guarantee Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
   5. During Guarantee Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
   6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
   7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 07 52 16

SECTION 07-6200 – SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide all metal flashing and sheet metal work, as shown on the drawings and as herein specified.
B. Related Sections include the following:
   1. Division 04 Section - Unit Masonry for through-wall flashing.
   2. Division 06 Section - Rough Carpentry for blocking, nailers, etc.
   3. Division 07 Section - Shingles.
   4. Division 07 Section - Joint Sealers.
   5. Division 07 Section - Painting.
   6. Division 07 Section - Roofing for flashing membranes.
   7. Division 07 Section - Roof Specialties for manufactured roof specialties not part of sheet metal flashing and trim.
   8. Division 07 Section - Roof Accessories for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
   9. Division 07 Section - Expansion Control for manufactured sheet metal expansion-joint covers.

1.03 PERFORMANCE REQUIREMENTS AND QUALITY ASSURANCE

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
B. Sheet Metal Standard for Flashing and Trim: Comply with the latest edition of NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
   1. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
C. Fabricated copings and roof edge flashings: Roof edge flashings shall be designed without exposed fasteners, including at the inside face of copings, and as follows:
   1. Wind-Uplift Resistance: Provide metal roof edge flashing assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
      a. Uplift Rating: UL 90.
   2. FM Approvals Listing: Design, fabricate and install copings and roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90 or greater where required by local codes or authorities having jurisdiction, whichever

requirement is most stringent. Identify materials with name of fabricator and design approved by FM Approvals.

3. SPRI Wind Design Standard: Fabricated copings and roof edge flashings for low slope roofs shall be designed and installed for wind loads in accordance with IBC Chapter 16, including local code amendments as applicable, and tested for resistance in accordance with Test Methods RE-1, RE-2 and RE-3 of ANSI/SPRI/FM 4435/ES-1.
    a. Roof edge products shall be UL Classified by Underwriters Laboratories, Inc. or other building code approved 3rd party verification of compliance with the ANSI/SPRI/FM 4435/ES-1 Wind Design Standard.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Account for temperature change of 120 deg F ambient, 180 deg F material surfaces.

E. Installer: Engage an experienced installer who has completed similar work of a comparable scale with a record of successful performance.

1.04 GUARANTEE

A. Sheet metal applicator and General Contractor shall personally guarantee sheet metal work for a period of Two-Years after acceptance of the building by the Owner against any defects or water leaks. Guarantee shall include all labor and materials necessary to correct any defects or water leaks upon notice from the Owner.

B. Furnish manufacturer's standard 20 year warranty stating architectural fluorocarbon finish will be:
    1. Free of fading of color change in excess of 6 NBS units as measured per ASTM D 2244-68;
    2. Will not chalk in excess of numerical rating of 7 when measured in accordance with standard procedures specified in ASTM D 659-74;
    3. Will not peel, crack, chip, or de-laminate.

1.05 SUBMITTALS

A. Division 01 Section - Submittal Procedures: Procedures for submittals.

B. Submit shop drawings for review and approval prior to ordering of materials and fabrication of the required shapes and metal flashings. Submittal for the coping system is required.

C. Failure by the contractor to submit shop drawings required above shall release the Architect from any liabilities due to the negligence on the part of the Contractor to comply with the construction documents.

D. Samples: Submit samples of sheet metal flashings, trim, copings, accessory items, and prefinished items of profiles, gauge and finish to be used.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sheet metal for receivers and counter-flashings: 24 gauge or as noted on drawings galvanized sheet steel bent to required shapes.

B. Sheet metal for downspouts, leader boxes, scuppers, eave flashing, copings, gravel stops, gutters, drip edges and similar exposed items shall be 20 gauge hot-dip galvanized sheet steel. Bend to required shapes.

C. Stainless Steel Sheet: ASTM A 240 / A240M or ASTM A 666, type 304, dead soft, fully annealed. Provide sheet in 18 gauge thickness for jamb flashing.

D. Lead: Weight 4 lbs. per square foot.

E. Solder: ASTM D32, Alloy gauge 58, 50% tin, 50% lead.2.01C
F. Gutter, Downspout and Fascia at Canopies and Metal Roofing: 24 Gauge galvanized steel with Kynar 500 coating. Provide 1" straps at 30" o.c. and bracket hangers at 30" o.c. Gutter to be color as selected by Architect.
G. Gutter and Downspout Alternate:
   1. **Sizes: Refer to drawings for sizes of gutters and downspouts.**
   2. **Gutter thickness: 0.032 gauge thick aluminum**
   3. **Downspout thickness: 0.027 gauge thick aluminum**
   4. **Finish of Gutter and Downspouts: Kynar 500**
   5. **Color: Selected from manufactures standard colors**
H. Shop-Fabricated Fascia: 22 Gauge galvanized steel pre-formed fascia installed over roofing membrane. Basis of Design construction shall be as profiled on the drawings, or shall be patterned after Hickman Edge Systems "Extruded TerminEdge EX MB", or approved equal.
   1. Fascia Cover: Fabricated from 22 Gauge galvanized steel, prefinished unless otherwise noted.
   2. Corners: Mitered, preformed and continuously welded.
   3. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
   4. Finish for Galvanized Steel: Kynar coating in colors as selected by Architect.
I. Finish for Galvanized Steel: Kynar coating in colors as selected by Architect.
J. Nails for Sheet Metal Work: 10 Gauge galvanized ring type steel of sufficient length to adequately secure sheet metal work.
K. Aluminum Trim Fasteners: Exposed fasteners shall be aluminum or stainless steel. Unexposed fasteners may be cadmium or zinc plated steel in accordance with ASTM A164-55 and 165-55. Steel anchors shall be properly insulated from aluminum.
L. Roof Penetration Flashing: Lead coated copper 16 oz./SF. Roof Penetration Flashing: Lead coated copper 16 oz. /SF.
M. Through-Wall, Door/Window Sill and Head Flashings:
   1. Where embedded in masonry (not exposed to view): 3 oz. copper composite Multi-Flash 500 by York or approved equal. See Division 4 section “Unit Masonry”.
   2. Where exposed to view: Prefinished 24 gauge galvanized steel with PVDF coating in color(s) as selected by Architect. Provide with drip edges hemmed 1/2” on underside.
N. Metal Jamb Flashing: Provide 18 gauge stainless steel, with hemmed edge.
O. Reglets: Equal to Fry CO, original metal reglet.
P. Counter Flashing. "Springlock Flashing" by Fry Reglet.
Q. Sheet Metal Fasteners: Galvanized steel with washers where required.
R. Hooded Pans with Pourable Sealant: As detailed in drawings, constructed of 20 gauge galvanized sheet steel, riveted and soldered watertight. Provide hooded pans at all new pipe, conduit, refrigerant line and other similar through-roof penetrations as necessary where power / condensate do not penetrate within RTU roof curbs. Bed flanges with plastic cement (Fed. Spec. SS-C-153, Type II) on top of roofing. Caulk around penetrations. Fill pans with roofing granules to 1" from top, and fill to the top with pourable sealant. Mold sealant to cone shape sloping to outside.
   1. Provide pans of adequate sizes for penetrations as indicated in Drawings, including space between penetrations within the same hooded pan.

2.02 FABRICATION

A. All exposed edges shall be hemmed 1/2" on underside.

2.03 ALUMINUM FINISHES

A. General: Comply with Aluminum Association’s (AA) "Designation System for Aluminum Finishes: for finish designations and application recommendations.

B. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating; as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.
   1. Fluoropolymer 2-Coat Coating system: Manufacturer's standard 2-coat, thermo cured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
      a. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.

PART 3 - EXECUTION

3.01 INSPECTION OF SURFACES

A. Applicator responsible for inspecting substrates upon which sheet metal materials are to be placed for any defects or conditions that would impair finished installation. Application constitutes acceptance of the substrate.

3.02 APPLICATION

A. Details shown are design details, fabrication techniques, and methods as per SMACNA recommendations.
B. Proper and adequate provisions shall be made in fabrication, installing and fastening sheet metal work for expansion and contraction of metal and other materials entering into the work so that pulling, splitting, opening of joints, warpage or other failure of the work shall be prevented. Expansion joints in sheet metal placed not farther than 40 feet apart. Dissimilar metal surfaces contacting one another, protected by bituminous coating to prevent galvanic or corrosive action from occurring.
C. Counter flashing constructed in lengths not exceeding 10 feet and installed in receiver so that flashing lays tightly against base flashing and overlaps base flashings a minimum of 4 inches. Joints between sections shall be tight and lay flat. Metal at corners continuous. Bent, crimped or warped sections are not permitted.
   1. Coordinate counterflashings with roofing installation of termination bars at top edge of roofing base flashings.
D. Install hooded sealant filled pans at equipment supports, pipes, conduits and other items penetrating roof or at items resting on roof without integral curbs and base flashing. Bed flanges with plastic cement (Fed. Spec. SS-C-153, Type II) on top of roofing. Caulk around penetrations. Fill pans to 1" from top with roofing granules. Fill top inch of pans with pourable sealant and mold to cone shape sloping to outside.

3.03 INSTALLATION

A. General: unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by method indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
   1. All complete work shall be water and weathertight. Joints, cuts, miters, splices or other installation means made as neat as possible. Fastenings as inconspicuous as possible.
B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicate, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant

performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Expansion Provisions: Provide for thermal expansion of exposed sheet metal work. Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less that 1 inch deep, filled with mastic sealant (concealed within joints).

D. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches, except where pretinned surface would show in finished Work.
   1. Do not solder the following metals:
      a. Aluminum.
   2. Pretinning is not required for the following metals:
      a. Lead-coated copper.
   3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

E. Sealed Joints: Form no expansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
   1. Use joint adhesive for nonmoving joints specified not to be soldered.

F. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

G. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
   1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
   2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

H. Roof-drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA'S Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system installation. Coordinate flashing and sheet metal items for steep-sloped roofs with roofing installation.

I. Roof-Penetration Flashing; Coordinate roof-penetration flashing installation with roofing and installation of items penetrating roof. Install flashing as follows:
   1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
   2. Seal and clamp flashing to pipes penetrating roof, other than lead flashing on vent piping.

3.04 FLASHING & COUNTERFLASHING REQUIREMENTS

A. Joints in thru-wall flashings and counterflashings shall be lapped 4" minimum with laps bedded in sealant.

B. Head and sill flashings shall not have joints and shall have sides turned up (edge dams) with all corners folded, not cut and shall extend 9" minimum beyond both sides of opening.

C. Head, sill and thru-wall flashings shall be set in a bead of sealant applied under the exterior edge of the flashing and on top of the masonry or lintel angle on which the flashing rests.

D. Penetrations in thru-wall flashing are not permitted. Vents in thru-wall flashing shall be completely flashed and water tight.

E. Metal reglets shall have a bead of sealant installed to complete system with counterflashing.

F. All thru-wall flashing shall extend through and up the interior face of exterior gypsum sheathing, as applicable.

G. Install metal jamb flashing, in material as noted, over adjacent air barrier system at jambs of curtainwall and other locations as shown on the drawings, as required to close openings to cavity wall. Mechanically attach with stainless steel fasteners and seal metal flashing to wall / air barrier with self adhering membrane flashing as specified in Division 07 Section - Modified Bituminous Sheet Air Barriers.

3.05 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

END OF SECTION 07 62 00

SECTION 07-7200 – ROOF ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide roof accessories including pipe pedestals, pipe portals and other items as indicated on the drawings.
B. Related Sections include the following:
   1. Division 05 Section - Metal Fabrications, for coordination with roof access ladders.
   2. Division 06 Section - Rough Carpentry, for wood blocking.
   3. Division 07 Section - Roofing Section(s).
   4. Division 07 Section - Sheet Metal Flashing and Trim.
   5. Division 07 Section - Roof Specialties.
   6. Division 07 Section - Sealants.
   7. Division 22 Sections for Plumbing.
   8. Division 23 Sections for Mechanical.
   9. Division 26 Sections Electrical.

1.03 QUALITY ASSURANCE

A. Comply with "NRCA Roofing and Waterproofing Manual" for installation of units.

1.04 SUBMITTAL

A. Submit manufacturer technical product data and rough-in diagrams, details.

1.05 PRODUCT DELIVERY

A. Deliver products in manufacturers original unopened packages, clearly marked with brand name and model number.
B. Store materials on clean, raised platforms with weather protective covering when stored outdoors.

1.06 WARRANTY

A. Manufacturer shall guarantee against defects in material and workmanship for a period of five years.

1.07 PROJECT CONDITIONS

A. Any equipment curb heights indicated in Drawings are minimum curb heights required in general. Taller curbs may be required for minimum height above adjacent roofing for roof warranty, including tapered insulation and crickets. All curbs shall be tall enough to

accommodate minimum curb height, or minimum heights above roof as indicated in Drawings, or minimum 8" above highest adjacent roof surface, whichever is greatest. Coordinate with roofing installer to confirm total curb heights required.

B. Do not install materials during inclement weather or when air temperature may fall below 40° F, including wind chill.

C. Do not install materials over damp, frozen or otherwise unsuitable surface.

PART 2 - PRODUCT

2.01 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
   1. BILCO Company, New Haven, CT, (203) 934-6363
   2. Custom Curb, Incorporated, Chattanooga, TN (800) 262-6669.
   3. Kentuckiana Curb Company, Louisville, KY (800) 382-2872.
   4. The Pate Company, Broadview, IL (800) 243-3018.
   5. Thybar Corporation, Addison, IL (708) 543-5300.

B. Division 01 Section - Product Requirements: Product options and substitutions. Substitutions: Permitted.

2.02 PREFABRICATED PITCHED ROOF SERVICE PLATFORM

A. Basis of Design: Pitched Roof Service Platform by PRSP, Inc, P.O. Box 8018 Canton, OH, 44711, info@prsp-inc.com, 877-455-7577.
   1. Pitched Roof Service Platform:
      a. Platforms to conform to ICC standards including size parameters, loads and service area. Coordinate with manufacturer on pitch and roof composition.
      b. To be equipped with tool kick guards.
      c. Platform shall be left to right horizontal configuration.
      d. Platform to be equipped with rails extending not less than 42 inches above stable permanent platform and to extend not less than 30 inches from serviceable part of unit.
      e. Materials:
         1) Platform shall be stainless steel fully welded at each joint. Joints shall be polished and grounded to smooth edges.
   2. Dimensions: Reference Plans. Minimum dimensions = 32 inches + width of exhaust vent hood + 32 inches.
   3. Optional Base: Aluminum Grating
   4. Gauge:16 gauge 430 Stainless Steel
   5. Slope of Roof: Reference Plans
   6. Provide with optional flashing boot.
   7. Hardware Kit:
      a. Installation hardware kit to be provided by manufacturer.

2.03 ROOF HATCHES

A. Roof Hatches: Metal roof-hatch units with lids and insulated single-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.

B. BOD Standard Prefabricated Roof Hatch: Unit shall be 3 foot - 0 inch x 3 foot - 0 inch for roof ladder access equal to Bilco, Type 'E' single leaf type. Frame with integral curb double wall construction with welded or sealed mechanical corner joints. Provide double wall cover with 1 inch insulation core. Equip unit with complete hardware set including hold open devices,

interior padlock hasps and both interior and exterior latch handles. Unit shall be fully gasketed and completely fabricated of galvanized steel.

1. Ladder Safety Post: Adaptable to steel ladder at roof access. Device shall be manufactured of high strength steel with telescoping tubular section that locks automatically when fully extended. Upward and downward movement shall be by a stainless steel spring. Finish shall be **[black] [yellow]** enamel. Equal to Bilco, "Model 1 Ladder Up."
2. Roof Hatch Railing: Fixed hatch railing system providing fall protection for roof hatch openings meeting OSHA fall protection regulations 29CFR 1910.23. Posts and rails are 1 1/4 inch schedule 40 pipe in 6061 T6 aluminum alloy. Curb mounting brackets and teardrop brackets are 6063 T5 aluminum extrusion. Locking mechanism is cast aluminum and spring hinges and all fasteners are type 316 stainless steel. Equal to Bilco RL2-STB 36x30 Hatch Railing.

2.04 PIPE PORTALS

A. Curb-Mounted Pipe Portal: Insulated roof-curb units with welded or mechanically fastened and sealed corner joints, stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom; with weathertight curb cover with single or multiple collared openings and pressure-sealed conically shaped EPDM protective rubber caps sized for piping indicated, with stainless steel snaplock swivel clamps.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc.

B. Flashing Pipe Portal: Formed aluminum membrane-mounting flashing flange and sleeve with collared opening and pressure-sealed conically shaped EPDM protective rubber cap sized for piping indicated, with stainless steel snaplock swivel clamps.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc.

2.05 PREFORMED FLASHING SLEEVES

A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches (300 mm) high, with removable metal hood and perforated metal collar. Unit shall be Thaler Metal Industries, "Dryer B-1 for flat/lowslope roofs" and "Dryer B-2 for slope roofs", as required for pipe sizes, or approved equal.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Custom Solution Roof and Metal Products.
   b. Menzies Metal Products.
   c. Thaler Metal Industries Ltd.
2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
3. Diameter: As indicated on Drawings.
4. Finish: Manufacturer's standard.

B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Custom Solution Roof and Metal Products.
   b. Menzies Metal Products.

c. Milcor; Commercial Products Group of Hart & Cooley, Inc.
d. Thaler Metal Industries Ltd.

2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
3. Height: 7 inches (175 mm)
4. Diameter: As indicated on Drawings
5. Finish: Manufacturer's standard.

C. Sloped Roof Pipe Seal: One piece flexible aluminum base with pleated EPDM cone adjustable to any roof slope and rated for high temperature resistance (tested to: minimum 225 Degrees F continuous exposure), equal to Pate "Dektites", size as required by pipe, or approved equal.
1. Type and configuration to suit roof pitch.
2. Sizes: Sized to pipe penetrations.
3. Color: As selected from manufacturer's standard color selection.
4. Hardware: Provide with adjustable metal clamp for clamping top of graduated boot to pipe, and Manufacturer's recommended base fasteners for the conditions and substrates as indicated.
5. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Aztek Washer Company "Master Flash"
b. Marco Industries "Roof Boots",
c. The Pate Company, "Dektites"

D. Pipe Hood Assemblies: Heavy gauge aluminum construction with removable top cover, face plate and 3 sided body for easy access. Separate fully welded and insulated aluminum mounting base furnished to isolate hood from galvanized curb. Pate "PHA" system or approved equal.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Aztek Washer Company
b. Marco Industries
c. The Pate Company, "Dektites"

2.06 MISCELLANEOUS MATERIALS

A. Exhaust / Intake Vent Jacks for steep slope roofs: Formed 24 gauge galvanized steel vent jack with bird screen and damper, and with integral base for flashing into metal roofing, equal to Greenheck "RJ" series vent jacks. Size to ducts as indicated in Mechanical drawings. Color: As selected by Architect.

B. Grease Guard at Kitchen Exhaust Fans: G2® Grease Guard® Rooftop Defense and Filtration System as manufactured by Dawg, Inc., or approved equal.

C. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

D. Pipe Umbrellas: Provide one piece pipe umbrellas **where indicated in Drawings.** Sizes to match penetrations indicated.

E. Cellulosic-Fiber Board Insulation: ASTM C208, Type II, Grade 1, thickness as indicated.

F. Glass-Fiber Board Insulation: ASTM C726, nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 degree F x h x sq. ft./Btu x in. at 75 degree F (29.8 K x m/W at 24 degree C), thickness as indicated.

G. Polyisocyanurate Board Insulation: ASTM C1289, thickness and thermal resistivity as indicated.

H. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, **containing no arsenic or chromium,** and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

I. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187**/**D1187M.

J. Underlayment:
   1. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

K. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
   1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.
   2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
   3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

L. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
   1. Sealants: As recommended by Manufacturer for conditions and substrates indicated. Where sealants may be visible in completed work, sealant colors shall match roofing or adjacent materials as selected by Architect from available standard colors.
   2. Elastomeric Sealant: ASTM C920, elastomeric [**polyurethane**] [**silicone**] polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
   3. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

PART 3 - EXECUTION

3.01 COORDINATION

A. Coordinate between trades as required to ensure waterproof installation acceptable to roofing installer and Manufacturer.
   1. Ensure roof curbs meet minimum height requirements above adjacent roofing, including insulation thickness, tapered insulation, and crickets.
   2. Coordinate with roofing Installer’s tapered insulation shop drawings to ensure curbs, pipes, vent caps, and other potential obstructions to flow of water will not occur within one foot horizontal of roofing valleys.
   3. Verify and coordinate actual roof slopes as required for level top of curbs.
   4. Coordinate installation of roofing membrane pads under all support pedestals.

3.02 INSPECTION

A. Examine areas to receive roof accessories to insure work of preceding trades is completed. Check surfaces to see that they are uniform in place, free from grease, oil or other debris which would affect proper installation. Application constitutes acceptance of substrate conditions.

3.03 INSTALLATION

A. Install roof accessories according to manufacturer's current printed written instructions and recommendations.
   1. Coordinate installation of accessories with roof and flashing installations. Provide weathertight installation.
   2. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
   3. Anchor roof accessories securely in place so they are capable of resisting indicated wind loads in accordance with the local building codes..
   4. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
   5. Fasteners, General: All fasteners shall be installed straight and to make proper seal at gaskets. No fasteners of any sort are allowed through top side of curb cap flashings. All fasteners in flashing caps shall be through vertical sides only. No fasteners of any sort are allowed through roofing membranes or materials unless specifically approved in writing by roofing installer and manufacturer, and approved by Architect.
   6. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of uncoated aluminum and stainless steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
   3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof Curb Installation: Install each roof curb so top surface lines are level, see Part 2 article "Fabrication".

D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

E. Roof-Hatch Installation:
   1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
   2. Attach safety railing system to roof-hatch curb.
   3. Attach ladder-assist post according to manufacturer's written instructions.

F. Heat and Smoke Vent Installation:
   1. Install heat and smoke vent so top perimeter surfaces are level.
   2. Install and test heat and smoke vents and their components for proper operation according to NFPA 204.

G. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane according to roof membrane manufacturer's instructions.

H. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

I. Prefabricated Pitched Roof Service Platform:
   1. Install per manufacturer’s installation instructions.
   2. Coordinate with other disciplines for proper flashing and sealants for proper drainage and watertightness.
   3. Provide blocking as necessary for platform.

3.04 ROOF PROTECTION AND CLEANING

A. Do not allow pipe cutting operations directly over roofing. If unavoidable, provide temporary roof protection acceptable to roofing installer.
B. Do not place or store items directly on roof that are heavy, have sharp corners, or might otherwise compromise the roofing membrane integrity. Provide temporary pads, plywood, or other protection as acceptable to roofing installer.
C. Check roof at the end of each day's work that fasteners are used above the roof and remove any excess or dropped fasteners and other hardware from roof. Notify General Contractor and roofing installer of any potential penetrations of the roofing due to loose fasteners in order to evaluate and make repairs as necessary.

END OF SECTION 07 72 00

SECTION 07-8413 – PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Furnish all labor, materials, tools, equipment and related items required for the complete installation of firestopping at penetrations through rated partitions and floors.
B. Related Sections include the following:
   1. Division 03 Section - Concrete Floor.
   2. Division 07 Section - Fire-resistive Joints.
   3. Division 09 Section - Drywall Partitions.

1.03 STANDARDS

A. All work under this section shall conform to the requirements of the Underwriters' Laboratories, Inc., the National Board of Fire Underwriters and the local building code. Where requirements specified differ from the requirements of any authorities having jurisdiction, the more stringent requirements shall apply.
B. Firestopping system shall be a complete system of materials supplied by one manufacturer.

1.04 QUALITY ASSURANCE

A. Source Limitations: Construction Manager shall engage a single entity to assume full responsibility for installation of all fire penetration firestopping, fire resistive joints, and fire penetration assemblies throughout project, both for items specified herein, and items as specified in other referenced specification Sections.
B. Qualifications of Installer:
   1. Five years experience in performing installation of materials with similar quantities of fireproofing materials.
   2. A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
   3. A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
C. Requirements of regulatory agencies:
   1. Building code requirements of the municipality for fire resistance ratings of areas to receive fireproofing materials.

2. Underwriters' Laboratories, Inc.: Classification marking.
3. Acceptance by ICBO, BOCA and SBCCI as described by National Evaluation Service Report, NER-332.

D. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced.

E. Testing:
1. Fire resistant rating of assemblies - ASTM E-814.
2. Compound shall meet all requirements of UL 1479.

1.05 SUBMITTALS

A. Installer’s qualifications.
B. Test Reports
1. Submit copies of fire test reports of fireproofing installation to substrate materials required.
2. Submit certified test reports of acceptable testing agencies which perform testing in accordance with ASTM E-119 and E-84.

C. Manufacturer's Instruction: Furnish manufacturer's printed material specifications and installation instruction for each type of fireproofing.
D. Certificates:
1. Furnish manufacturer's certification that materials meet or exceed specification requirements.
2. Furnish applicators certification that material has been completed as specified to meet fire resistance ratings and application requirements.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unopened packages bearing name of manufacturer and product identification.
B. Reject damaged packages found unsuitable for use and remove from job site.
C. Store materials off ground, under cover, and away from damp surfaces.
D. Keep materials dry at all times.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. Horizontal assemblies include floors, floor/ceiling assemblies, & ceiling membranes of roof/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

B. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.

C. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
E. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    1. Sealants: 250 g/L.
    2. Sealant Primers for Nonporous Substrates: 250 g/L.
    3. Sealant Primers for Porous Substrates: 775 g/L.

2.02 MATERIALS

A. Safing Insulation: Forming material, minimum 3" unfaced safing insulation with a nominal density of 4 pcf, and bearing the UL Classification Marking shall be "Thermafiber" as manufactured by Owens Corning.
B. Compound: Pliable, non-toxic, non-combustible, non-asbestos, low density, lightweight compound shall be "Firecode" as manufactured by USG Corp., "Flame Stop V" as manufactured by Flame Stop Inc. or "Metacaulk" as manufactured by Rectorseal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that all substrates to receive firestopping system are constructed according to the Construction Documents and acceptable to receive fire stop materials.

3.02 APPLICATION

A. Safing Insulation: Cut safing insulation slightly wider than the opening. Compress and tightly fit min. 2 1/2" or 3" thickness of insulation with nominal density of 4 pcf completely around penetrant.
B. Firestopping Compound: Trowel apply the compound from its container and work into the penetration opening. Apply compound to minimum 1/2" to 1" thickness on top of safing insulation. Ensure that compound is in contact with all surfaces and that entire opening is filled with safing and compound. Utilize appropriately rated product for specific rated partition application.

END OF SECTION 07 84 13

SECTION 07-9200 – JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes: Provide sealant required to close joints that would allow moisture or air to enter structure between fixed materials, as shown on the drawings and as herein specified, including but not limited to:
   1. Sealing of interior perimeter joints of window framing, door frames, and other openings in walls.
   2. Sealing interior and exterior walls to floor or roof decking/construction for fire resistive or thermal, moisture or acoustical barrier.
   3. Setting of thresholds in sealant.
   4. Sealing of joints between countertops and wall surfaces for a sanitary joint.
   5. Sealing of joints of every nature and description that would allow moisture or air penetration.
   6. Sealing of joints indicated to be caulked or sealed whether specifically mentioned herein or not.
   7. Sealing around all pipe, duct and vent penetrations.
   8. Sealing at paving joints.
B. Related Sections include the following:
   1. Division 04 Section - Unit Masonry Assemblies.
   2. Division 06 Section - Sheathing
   3. Division 06 Section - Interior Architectural Woodworking and Counter Tops
   4. Division 07 Sections – Thermal and Moisture Resistant Barriers
   5. Division 07 Section - Sheet Metal Flashing and Trim.
   6. Division 07 Section – Roofing Systems
   7. Division 07 Section - Expansion Control.
   8. Division 08 Sections – Door Frame and Window systems
   9. Division 08 Section - Aluminum Entrances and Storefront.
   10. Division 09 Section - Ceramic Tiling.
   11. Division 09 Section - Gypsum Board Assemblies.
   12. Division 09 Section - Painting.
   13. Division 21 Section - Fire Suppression.
   14. Division 22 Section - Plumbing.
   15. Division 23 Section - Mechanical.
   16. Division 26 Section - Electrical.
   17. Division 32 Section - Paving.

1.03 JOB CONDITIONS

A. Environmental Conditions: Sealant work not permitted when air temperature is below 40 degrees F.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications, color range, handling/installation/curing instructions, and performance tested data sheets for each elastomeric product or joint backing material.
B. Samples: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
C. Submit samples of joint backing material.

1.05 WARRANTY

A. The Contractor shall submit, in writing, a warrant that all sealant work executed under this Section shall be free from defects in materials and workmanship for a period of two (2) years from date of acceptance of the Project, and he shall remedy any defects in the sealant work during the warranty period.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    1. Architectural Sealants: 250 g/L.
    2. Sealant Primers for Nonporous Substrates: 250 g/L.
    3. Sealant Primers for Porous Substrates: 775 g/L.

2.02 MATERIALS

A. Chemical Compatibility, General: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
    1. Where new sealants will adjoin existing sealants to remain, confirm chemical compatibility of sealant type prior to preparing submittals. In the event of chemical incompatbility, suggest alternate compatible sealant products for those applications.
B. Primers: Non-staining type as recommended by sealant manufacturer for each working surface. Material shall not leave residue or stain on adjacent surfaces. Each joint must be primed prior to sealing.
C. Sealant for Interior and Exterior Masonry Control Joints: 1 part ultra low modulus silicone sealant equivalent to "Spectrum 1" by Tremco, or "890 NST" by Pecora. Color to match adjacent surfaces.
D. Materials for sealing top of wall to bottom of decking:
    1. For use at non-fire-rated (thermal and/or acoustical) construction: The following products are acceptable for thermal and air seal between top of wall and bottom of deck. At contractor’s option, use one of the following products:
        a. Closed cell 2-component spray applied polyurethane foam insulation and air barrier, Icynene ProSeal, or comparable product by another Manufacturer.

b. Single component, gun applied, closed cell polyurethane insulating foam sealant for gaps up to 3": Great Stuff Pro, Gaps and Cracks Insulating Foam by Dow Chemical Company, or comparable product by another Manufacturer.
c. Firmly pack gaps and voids above the stud track with Mineral Fiber Batt insulation (Refer to Division 07 or 09 for Thermal or Acoustical Insulation). Caulk gun or trowel apply, and trowel coat to form a continuous seal between top of sheathing and bottom of deck with USG "Acoustical Sealant", or comparable product by Tremco or Pecora. For thermal-only (non-acoustical) applications, apply sealant to exterior or unconditioned side of partition. For acoustical applications, apply sealant to both sides of the partition.
d. Contractor shall confirm chemical compatibility of sealant used with adjacent air barrier system(s).
e. Where top of wall sealant is used at perimeter wall construction, apply in manner to achieve a continuous air seal from top of air barrier system to bottom of deck, without gaps or voids. Confirm acceptable detail(s) with air barrier system Manufacturer. Refer to Division 07 "Air Barrier" Section(s) for air barrier materials.
f. Where top of wall sealant will be exposed in finished interior space, apply in a manner to produce an aesthetic finished result, flush with the face of wall. Cut spray foam flush with face of wall and neatly trowel acoustical sealant to a semi-smooth finish, and remove excess material.

2. For use at fire-rated construction: Refer to Division 07, Section "Joint Firestopping".

E. Sealant for Re-glazing: Medium modulus silicone sealant shall be Tremco's "Spectrem 2", or approved equal. Color as selected by Architect.
F. Sealant for Exterior Concrete Paving and Sidewalk Joints: Two part urethane (self leveling) sealant equal to "MasterSeal SL-2" by Sonneborne / BASF Chemical Co., "Urexpan NR-200" by Pecora, or "THC-900" Tremco. Provide non-sag product at joints in vertical curbs, equal to "MasterSeal NP-2" by Sonneborne / BASF.
G. Caulking for Interior Joints: One part acrylic latex sealant equivalent to "AC-20" by Pecora, "Tremflex 834" by Tremco, "Acrylic Latex" caulk by DAP, or "Sonolac" by Sonneborn.
H. Caulking for Countertop Joints: One-part clear silicone sealant, 860 by Pecora, or equal.
I. Precompressed Expanding Foam Sealant: Shall be Gray "Willseal 600" as manufactured by "Tremco", Beachwood, Ohio or approved equal.
J. Sealant for Gypsum Board joints for Acoustic Construction: USG "Acoustical Sealant" or equal by Tremco or Pecora.
K. Sealant for Windows for Acoustic Construction: Closed-cell polyvinyl chloride foam sealant with pressure-sensitive adhesive on one side; Norton® V740 Multipurpose Pressure Sensitive Adhesive Sealant Foam manufactured by Saint-Gobain.
L. Closed-cell tape sponge neoprene for Acoustic Construction: 1/4" x 1", Press-on Products (800-323-7467 or 630-628-2255), Part No. P-8200 or P-8100.
M. Non-Hardening Sealant for Acoustic Construction
1. Non-hardening polyurethane type, ASTM C920, Type M, Class 25, Grade NS: Tremco "Dymeric 511" or approved equal.
2. Non-hardening polysulphide type, ASTM C920, one-part: Pecora "GC-9" or approved equal.
3. Non-hardening silicone type, ASTM C920, Type S, Class 25, Grade NS, one-part, low modulus type: GE "Silpruf", Dow Corning 790, Tremco "Spectrum 1", Pecora 864, or approved equal..
N. Joint Backing: ASTM C1330, Non-staining closed cell polyethylene foam rod oversized 30% to 50%, equal to "MasterSeal 920" by BASF.
O. Foam Backer Rod for Acoustic Construction: ASTM C1330, Closed cell polyethylene,. Acceptable Manufacturers: ITP, Nomeco, or approved equal. (Available through Tom Brown, Inc. 800-446-2298)
P. Solvents and Cleaning Agents: Of a type specifically recommended by sealant manufacturer.

PART 3 - EXECUTION

3.01 COORDINATION AND INSPECTION

A. Coordinate sealing requirements with all trades for complete fire resistive, thermal, moisture, asthetic or acoustical barriers and trim.
B. Applicator shall examine surfaces receiving sealant or caulking for any defects or joint sizes which would not structurally perform or for any unusual conditions which would interfere with proper installation of sealant or caulking.

3.02 PREPARATION

A. Prepare joints in accordance with Manufactuer’s instructions.
B. Thoroughly clean all joints removing all foreign matter such as dust, oil, grease, dirt or other loose particles. Provide and apply non-staining primer as required by conditions and sealant manufacturer.
C. When primer is dry, compress backup and insert into joint leaving 1/4" to surface open for joint sealing or leave open 1/2 of joint width, but not less that 1/4".
D. Completely cut smooth and remove projection of existing gasket and/or sealant material at door and window framing to remain to achieve sound substrate for application.

3.03 APPLICATION

A. It is the intent and purpose and interpretation of this specification that in all areas, joints sealed shall be rendered structurally sound and impervious to the passage of water, moisture and dust.
B. Follow sealant manufacturer's instructions regarding mixing, surface application, priming and application procedure.
C. Sealant shall be applied under pressure with a hand or power activated gun having a nozzle of proper size to entirely fill joint void and shall be forced into joints with sufficient pressure to expel air and fill the joints solidly. All joint surfaces shall be neatly tooled to a smooth surface, free of wrinkles and result in a flush joint when dry.
D. Apply sealants when the ambient temperature is between 40° and 100° F.
E. All junctures between countertops, back splashes and walls shall be caulked with silicone sealant providing a sanitary tight joint.
F. All junctures between piping and substrate of partitions, floors and ceiling shall be caulked.
G. Precompressed expanding foam sealant shall be installed per manufacturer's requirements at all vertical expansion joints as noted on Drawings.
H. Apply sealant bead at least 1/2 inch thick under each edge of threshold. Remove excess and neatly point.
I. Apply sealant between exterior veneers and coping on outside face of exterior wall.
J. Caulk perimeter of window frame, door frame or other items penetrating, intersecting or abutting walls, ceilings, floors, etc.
K. Prime surface as required and apply sealant at all glazing, at metal to metal and glass to metal joints within the system.
L. Apply bead of sealant at base of wall board.
M. Furnish and install acoustical sealant at the following locations:
    1. All penetrations of partition, wall, and floor construction by ductwork, conduit, piping, or structure.
    2. Both sides of window frames to adjacent construction
    3. Perimeter of and penetrations through sound isolating ceilings, roof systems, and floor systems.
    4. Foam sealant at top of wall to underside of roof/floor deck, at partitions to deck that are indicated to be constructed to a STC rating.
N. Backer Rod shall be used in all joints, product to be constructed of closed cell foam, or appropriate resilient material for sealant. Dimension shall be minimum 30% greater than joint width, unless otherwise indicated on details.
O. Fill paving sealant full width of joint, and to within 1/8" of paving surface.

3.04 CLEANING

A. Clean adjacent surfaces free of sealant or soiling resulting from this work as work progresses. Use solvent or cleaning agent as recommended by sealant manufacturer. All finished work shall be left in a neat, clean condition.

END OF SECTION 07 92 00

07-9500 – EXPANSION CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
B. Related Sections Include the Following:
   1. Division 09 Section - Resilient Flooring.
   2. Division 09 Section - Tiling.
   3. Division 09 Section - Acoustical Ceilings.
   4. Division 09 Section - Gypsum Board Assemblies.
C. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 ACTION SUBMITTALS

A. Shop Drawings: For each expansion control system specified, include details showing plans, elevations, sections, splices, blockout requirements, and attachments to other work, as needed to coordinate the work. Indicate locations where tile or terrazzo work may require replacement of existing expansion joint covers. Coordinate work as required with structural and architectural drawings for slab depressions or recesses needed.
B. Samples: For each proposed expansion control system, provide sample for approval of color and finish specified.

1.03 COORDINATION

A. Coordinate with other trades to determine proper installation, removal and reinstallation, or replacement of expansion joint covers. Ensure substrates are prepared to receive covers as required.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, material, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
   1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
   2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control.

2.02 INTERIOR EXPANSION CONTROL SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated, as manufactured by Balco, Inc., or approved equal by one of the following:
   1. Architectural Art Mfg., Inc.; Division of Pittcon Industries.

2. Construction Specialties, Inc.
3. JointMaster/InPro Corporation.
4. Nystrom, Inc.

B. Source Limitations: Obtain expansion control systems from single source and from single manufacturer.

C. Floor-to-Floor:
1. Basis-of-Design Product:
a. 75FPE – Smooth Surface Mount
2. Design Criteria:
a. Joint Width: As indicated on Drawings, or to match existing conditions.
b. Type of Movement: Thermal, or to suit existing conditions.
3. Type: As shown on Drawings.
a. Cover-Plate, Glide-Plate or Center Plate Design: Plain, or as shown on drawings.
1) Recess Depth: As required to accommodate adjacent flooring

D. Wall-to-Wall:
1. Basis-of-Design Product:
a. Gypsum Board or Plaster (Field): Balco Inc., "WD-1".
b. Gypsum Board or Plaster (Corner): Balco Inc., "ACL-1".
c. Tile (Field): Balco Inc., "6TW-1".
d. Concrete Masonry Units: BCW – Pre-compressed Primary Seal
2. Design Criteria:
a. Nominal Joint Width: As indicated on Drawings, or to match existing conditions.
b. Type of Movement: Thermal, or to suit existing conditions.
3. Type: Accordion, or Glide Plate, as indicated.
a. Metal: Aluminum.
1) Finish: As selected by Architect from Manufacturer's standards.
2) Color: As selected by Architect from Manufacturer’s standards.

E. Ceiling-to-Ceiling:
1. Basis-of-Design Product: Balco Inc., "AC-1".
2. Design Criteria:
a. Nominal Joint Width: As indicated on Drawings, or to match existing condition.
b. Type of Movement: Thermal, or to suit existing conditions.
3. Type: Accordion.
a. Metal: Aluminum.
1) Finish: As selected by Architect from manufacturer's standards.
2) Color: As selected by Architect from manufacturer’s standards.

F. Ceiling-to-Wall:
1. Basis-of-Design Product: Balco Inc., "ACL-1".
2. Design Criteria:
a. Nominal Joint Width: As indicated on Drawings, or to match existing condition.
b. Type of Movement: Thermal, or to suit existing conditions.
3. Type: Accordion.
a. Metal: Aluminum.
1) Finish: As selected by Architect from manufacturer's standards.
2) Color: As selected by Architect from manufacturer’s standards.

2.03 EXTERIOR EXPANSION CONTROL SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated, as manufactured by Balco, Inc., or approved equal by one of the following:
1. Construction Specialties, Inc.
2. MM Systems, Inc.

B. Source Limitations: Obtain expansion control systems from single source and from single manufacturer.

2.04 MATERIALS

A. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), Alloy 6061-T6 for sheet and plate.
   1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
B. R. If SS, Brass or Bronze is desired coordinate with the manufacturer’s representative

PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare substrates according to expansion control system manufacturer's written instructions.
   1. Coordinate Dimensional control with Wood Flooring. Coordinate with other trades to route edge of wood flooring as required for flush installation.
B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems.
C. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.
B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.
   1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
   2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.
   3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
   4. Repair or grout blockout as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
   5. Install frames in continuous contact with adjacent surfaces.
      a. Shimming is not permitted.
   6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches from each end and not more than 24 inches o.c.
C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer’s written instructions. Install with minimum number of end joints.
   1. Provide in continuous lengths for straight sections.
   2. Seal transitions according to manufacturer’s written instructions. Vulcanize or heat-weld-field-spliced joints as recommended by manufacturer.
   3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
D. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

3.03 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete.
B. Protect the installation from damage by work of other Sections.

END OF SECTION 07 95 00

SECTION 08-1113 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide hollow metal doors and frames as shown on the Drawings and as herein specified.
   2. Fire Rated door assemblies.
   3. Tornado or hurricane resistant door and frame shelter assemblies.
B. Related Sections include the following:
   1. Division 04 Section - Masonry.
   2. Division 06 Section - Rough Carpentry.
   3. Division 07 Section - Flashing, Sheet Metal.
   4. Division 08 Section - Finish Hardware.
   5. Division 08 Section - Glazing.
   6. Division 09 Section - Gypsum Board.
   7. Division 09 Section - Painting.

1.03 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
C. Design Criteria: Doors and frames noted to have a specific hourly label, shall be Underwriter's Laboratories, Inc. labeled construction shall bear the required UL label.
D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.
   1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
   2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
   3. Smoke Control Door Assemblies: Comply with NFPA105.
      a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
E. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA257. Provide labeled glazing material.
F. Storm Shelter Openings: Provide complete door systems for hurricane or tornado storm shelters, and other areas of refuge, complying and tested according to FEMA P-361, Third

Edition (2015), Design and Construction Guidance for Community Safe Rooms; and ICC 500 (2014), ICC/NSSA Standard for the Design and Construction of Storm Shelters.

1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Pre-Installation Conference: Conduct conference in compliance with requirements in Division 01 with attendance by representatives of Supplier, Door and Door Hardware Installer(s), Security System Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, STC ratings, hardware reinforcements, profiles, anchors, insulation values, fire-resistance rating, and finishes.

B. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

C. Manufacturer shall furnish a certificate to the Owner evidencing that materials delivered meet the labeled and/or fire resistive construction requirements.

D. Shop drawings and details based on the Contract Documents shall be submitted to the Architect for review prior to fabrication of materials. Shop drawings shall indicate:

1. Elevations of each door design.
2. STC ratings where appropriate.
3. Insulation values for exterior doors and frames.
4. Hardware mounting heights
5. Details of doors, including vertical and horizontal edge details and metal thicknesses.
6. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
7. Locations of reinforcement and preparations for hardware.
8. Details of anchorages, joints, field splices, and connections.
9. Details of accessories.
10. Details of moldings, removable stops, and glazing.
11. Details of conduit and preparations for power, signal, and control systems.

E. Concurrent Review: Submit submittals under this Section together with all other door and door hardware submittals for concurrent review of door openings.

F. Samples: Coordinate paint finish samples with all exterior metal finish samples including storefront system, metal roofing system, overhead coiling doors, four-fold doors and sectional doors. Provide finished painted samples on substrate indicated for review and approval prior to fabrication: 3 - 12”x 12” samples minimum. Resubmit as required to obtain approval.

1.05 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Material: Individually packaged in cartons, completely protecting frames.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Frames shall be stored under cover on wood sills that will prevent rust and damage. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity. Do not use un-vented plastic.

1.07 JOB CONDITIONS

A. Coordination
   1. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.
   2. The Contractor shall provide door and frame manufacturer with an approved hardware schedule, templates and hand for all doors. Contractor shall advise door and frame manufacturer of any changes after information has been forwarded.
   3. Contractor will be completely responsible for coordination of information between hardware, door and frame manufacturer. Contractor shall coordinate throat dimensions and clearance at thresholds and sill conditions with adjacent construction. Any materials not properly coordinated shall be replaced by the Contractor at his own expense.
   4. Contractor shall coordinate frame preparation requirements with the access control installer prior to preparing submittals.
   5. Coordinate reinforcing and preparation for hardware at doors with lites, including lite frames. Requirements of Texas Accessibility Standards for maximum height above floor of the bottom of the vision lite may likely require door hardware to be mounted slightly lower than standard height in order to avoid a conflict between hardware and door lite frames. Pay particular attention to exit device mounting.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 metallic coating.
C. Door Frame Anchorage Devices: ASTM A 653/A, Commercial Steel (CS), Type B, with minimum G60 metallic coating. Provide with minimum of 6 wall anchors and 2 adjustable base anchors, manufacturer's standard design. Provide UL anchors as required. Contractor is responsible to coordinate anchor types required with adjacent construction.
   1. Use metal tee anchors at frames in CMU masonry unless otherwise noted.
D. Exterior and Interior Door Frames: Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8, for physical performance level, and HMMA 867 for door construction, in depth and profiles indicated. Furnished with 2" faces (4" head at masonry) and 5/8" stops. Strike jambs provided with 3 factory installed rubber bumpers, and two per door leaf at head of pair door frames. Provide UL rating as required. Frames fabricated of quality 16 gauge annealed steel. Exterior frames to have A60 coating. Interior frames can be standard CRS.
   1. Removable stops at exterior frames located at interior side of frames for security and waterproofing.
   2. Removable stops at interior frames located at interior (room) side of interior frames.
E. Flush Doors: ANSI/SDI A250.8, 1-3/4" Flush type door with no visible edge seams. Polyurethane core. Reinforcements provided for all hardware. Doors mortised for hardware. Provide louvers and fire rating as required. Faces constructed of quality annealed steel as follows
   1. Interior Doors: Faces constructed of quality annealed steel as follows:
      a. HM-Typical Interior, except where noted otherwise: Heavy Duty (Level 2), 18 gauge steel. Steel stiffened laminated core with fiberglass filler with no stiffener face welds, in compliance with HMMA 867 “Laminated Core”.
         1) Provide 22 gauge steel-stiffeners at 6 inches on-center internally welded at 5" on-center to integral core assembly, No stiffener face welding is permitted.
         2) Provide Heavy Duty (Level 2), 18 gauge steel for interior doors at the Air Locks.
   2. Exterior doors, and doors between conditioned and unconditioned or heated only spaces, shall have minimum R factor of 3.4 including insulated door, thermal-break frame and threshold, and flush closing channel at top rail. Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 “Laminated Core”.

a. Extra Heavy Duty (Level 3), 16 gauge steel at exterior doors and doors opening to the apparatus bay.

3. Use other type(s) of steel stiffened cores may be used where required to achieve indicated R-values, STC ratings, and fire ratings, as approved by Architect.
4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
5. Hardware Reinforcements: Shop Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
6. Door louvers: Provide manufacturers standard flush louver. Refer to Division 08, Section "Wood Doors".

F. Divided Lite Door: 16 Gauge, 1-3/4" x 5" tubular top and side stiles and 10" bottom rail with mitered, face-welded corners. Doors shall be mortised, reinforced, drilled and tapped to receive mortise hardware. Door shall be similar to Ceco "Imperial", or approved equal. Provide insulated metal panel or 1/4" tempered glass as shown on drawings.

G. Door Mullion: Provide complete heavy duty mullion at each pair of hollow metal doors indicated in door types to receive center mullions, except where removable mullions are indicated in the hardware schedule.

1. Refer to Division 08, Section "Door Hardware" for doors to receive removable mullions. Provide filler blocks at removable mullions except where the frame profile provides support behind the full width of the mullion bracket at head conditions.

H. Accessory Materials: Provide complete fasteners, miscellaneous materials and accessories as required for complete installation including but not necessarily limited to the following:

1. Grout mix shall provide a 4" maximum slump consistency, hand troweled in place. Grout mixed to a thin "pumpable" consistency shall not be used.
2. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.02 HOLLOW METAL DOORS AND FRAMES FOR ICC-500 STORM SHELTERS

A. Provide complete tornado or hurricane resistant door and frame shelter assemblies constructed to resist the design wind pressures for components and cladding and missile impact loads as described in ICC 500 - 2014, ICC/NSSA Standard for the Design and Construction of Storm Shelters. Only single opening and paired opening doors and their frames constructed to resist calculated design wind pressures and laboratory tested missile impacts are acceptable.

1. Door systems, both single doors and paired openings, tested and complying with ICC 500 - 2014 and FEMA P-361 (2015), Design and Construction Guidance for Community Safe Rooms and supported by third party test results.
2. Sheets fabricated on exterior openings from commercial quality hot dipped zinc coated steel complying with ASTM A924 A60. Gauges to be in accordance with manufacturers tested assemblies.
3. Vertical Edges: Vertical edges to have the face sheets joined by a continuous weld extending the full height of the door. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches.
4. Top Edge: Reinforce top of doors with a continuous steel channel extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached and welded in place with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".

B. Metal Frames: Subject to the same compliance standards and requirements as standard hollow metal frames, provide complete tornado or hurricane resistant door and frame assemblies, for both single doors and paired openings, tested and labeled as complying with ICC 500 - 2014 and FEMA P-361 (2015) and supported by third party test results.

1. Fabricate frames from 14 gauge hot dipped zinc coated steel that complying with ASTM designations A924 A60.

C. Basis of Design: Subject to compliance with requirements, provide one of the following, or comparable products by another Manufacturer:

1. CECO Door Products (C) – StormPro, Series.
2. Curries Company (CU) - StormPro Series.

2.03 LITE OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.04 FABRICATION

A. Frames shall have all joints mitered, continuous full welded and ground smooth. No putty or filler permitted at joints.
B. All door frames mortised for 1-1/2 pair 4-1/2 x 4-1/2 standard weight hinges. Frames of 48" width shall have 2 pair butts. (Re: Door Schedule and Hardware Schedule for Number and Location.) Frames mortised and reinforced for hinges, (7 ga. 1-1/4" x 10" min.), strikes, (12 gauge steel), and surface applied hardware, (12 ga. steel), as required.
C. All door frames shall be prepared for installation of silencers.
D. Hollow Metal Frames:
    1. Welded Frames: Frames shall have all joints mitered, continuous full welded and ground smooth. No putty or filler permitted at joints Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
        a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
    2. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
    3. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
    4. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
    5. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
    6. Jamb Anchors: Provide number and spacing of anchors as follows:
        a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c.
        b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c.
    7. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
    8. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.
E. Door Mullion: Provide complete heavy duty mullion at each pair of hollow metal doors except where removable mullions are indicated in the hardware schedule.

1. Refer to Division 08, Section "Door Hardware" for doors to receive removable mullions. Provide filler blocks at removable mullions except where the frame profile provides support behind the full width of the mullion bracket at head conditions.

F. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
   1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
   2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
   3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
   4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.
   5. Coordinate reinforcing and preparation for hardware at doors with lites including lite frames. Requirements of Texas Accessibility Standards for maximum height above floor of the bottom of the vision lite may likely require door hardware to be mounted slightly lower than standard height in order to avoid conflict between hardware and door lite frames. Pay particular attention to exit device mounting.

2.05 FINISH

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
B. Doors and Frames for exterior openings shall be galvanized before primer is applied using a hot-dip coating of zinc.
C. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings
D. Field Painting: Refer to Division 09, Section “Painting”.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
C. Check for coordination with electrical preparation, and other coordination items as identified in Part 1 of these specifications, and in the pre-installation conference.
D. Proceed with installation only after unsatisfactory conditions have been corrected

3.02 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up facory-applied finishes where spreaders are removed.
B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
B. Anchor ceiling struts to construction above with fasteners to suit conditions. Brace frames as necessary until built into permanent construction.
C. Exercise extreme care when installing door frames. All door frames which are installed out of plumb, distorted and not level or in a manner which does not permit proper installation of doors, must be removed and replaced with new frames in a manner satisfactory to the Architect.
    1. Knock-down frames installed with tight miter joints at corners and meeting at corners without any noticeable lip between head and jamb pieces.
D. Clearances:
    1. Non-Fire-Rated Standard Steel Doors:
        a. Allow maximum of 1/16" clearance at head and jamb.
        b. Allow maximum of 1/2" clearance at floors.
        c. Allow maximum of 1/4" clearance at thresholds.
    2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
E. All exterior door frames , doors between apparatus bay and living quarters doors installed in CMU wall openings shall be grouted solid. Close off openings to wall cavities as indicated in Drawings and as required.
    1. Coat interior sides of frames to received grouting with a thin brush or spray coat of bituminous paint, to inhibit rusting and pitting.
F. Sound Deadening: Coat interior sides of frames with 1/8” thick heavy coat of fibered asphalt emulsion and Pack acoustical insulation continuously into frames at partitions calling for acoustical insulation in the wall assembly.
G. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.04 ADJUSTING, CLEANING AND PROTECTION

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
    1. Refer to Division 01, “Substantial Completion Readiness Checklist” for additional list of final checks prior to requesting inspection.
B. Remove grout and other bonding material from hollow metal work immediately after installation.
C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint
D. Protect metal doors and frames and their finishes from damage and detrimental soiling during the remainder of construction.
    1. Repair and repaint hollow metal that is damaged or soiled, to eliminate evidence of damage, in a manner acceptable to Architect. Replace components that cannot be repaired.
E. Clean doors and frames prior to inspection for substantial completion. Touch up paint finish as required. Clean with products that will not damage finishes.

END OF SECTION 08 11 13

SECTION 08-1416 – FLUSH WOOD DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Solid-core doors with wood-veneer faces.
   2. Factory finishing of flush wood doors.
   3. Factory fitting flush wood doors to frames and factory machining for hardware.
B. Related Sections:
   1. Division 04 Section "Unit Masonry Assemblies".
   2. Division 05 Section "Light Gauge Metal Framing".
   3. Division 08 Section "Metal Doors and Frames".
   4. Division 08 Section "Door Hardware".
   5. Division 08 Section "Glazing" for glass view panels in flush wood doors.
   6. Division 09 Section "Gypsum Board Assemblies".
   7. Division 09 Sections "Painting" for field finishing and touch-up of wood doors.

1.03 ACTION SUBMITTALS

A. Concurrent Review: Submit all door-related submittals together for concurrent review.
B. Product Data: For each type of door indicated. Include details of core and edge construction, STC acoustical rating, insulating R-value, hourly fire rating, louvers, and trim for openings Include factory-finishing specifications.
C. Product Schedule: Door schedule indicating door and frame location, type, size, fire protection rating, and swing. Coordinate with hollow-metal doors and frames schedule submittal, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.
D. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
   1. Indicate dimensions and locations of mortises and holes for hardware.
   2. Indicate dimensions and locations of cutouts.
   3. Indicate requirements for veneer matching.
   4. Indicate doors to be factory finished and finish requirements.
   5. Indicate fire-protection ratings for fire-rated doors.
E. Samples for Initial Selection:
   1. For factory-finished doors.
   2. Manufacturer's samples or selectors for louvers, frames, and other prefinished materials as applicable.
F. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 6 by 8 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Samples for frames for louvers and light openings, 6 inches long, for each material, type, and finish required.

1.04 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.
B. Quality Standard Compliance Certificates: AWI Quality Certification. Program certificates.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors from single manufacturer.
B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.
    1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
    2. Temperature-Rise Limit: At vertical exit enclosures and at exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
D. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
E. Preinstallation Conference: Conduct conference at Project Site to comply with Division 01, Section "Project Management and Coordination".

1.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.
B. Deliver doors to building after wet trades have been completed and building is within normal occupancy humidity conditions. Doors shall be delivered in manufacturer's name and identifying symbol on covering. Doors shall be stored flat with protective coverings provided to protect surfaces. Doors shall not be dragged over one another.
C. Mark each door on top or bottom rail with opening number used on Shop Drawings.

1.07 PROJECT CONDITIONS

A. Comply with Manufacturer's environmental limitations.
B. Coordination:
    1. The Contractor shall provide door manufacturer with approved hardware schedules, templates and hand for all doors. Contractor shall advise door manufacturer of any changes after information has been forwarded. Contractor will be completely responsible for coordination between hardware, door and frame manufacturers. Any materials not properly coordinated shall be replaced by the Contractor at his own expense.
    2. Door manufacturer shall be responsible for properly coordinating information received by him so that doors are properly finished, machined and ready to hang.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
      b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
   2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
   3. Warranty Period for Solid-Core Exterior Doors: Five years from date of Substantial Completion.
   4. Warranty Period for Solid-Core Interior Doors: Life of installation.
   5. Warranty Period for Hollow-Core Interior Doors: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Masonite Architectural
   2. Curtis Corp.
   3. Eggers Industries.
   4. Graham; a Masonite company.
   5. Haley Brothers, Inc.
   6. VT Industries Inc.

2.02 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.
B. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
C. WDMA I.S.1-A Performance Grade: As indicated.
D. WDMA I.S.1-A Performance Grade:
   1. Heavy Duty unless otherwise indicated.
   2. Extra Heavy Duty: public toilets, janitor's closets, exits
   3. Standard Duty: Closets (not including janitor's closets), private toilets.
E. Structural-Composite-Lumber-Core Doors:
   1. Structural Composite Lumber: WDMA I.S.10.
      a. Screw Withdrawal, Face: 700 lbf.
      b. Screw Withdrawal, Edge: 400 lbf.
F. Fire-Protection-Rated Doors: Doors noted to have a specific hourly label, fabricated in accordance with Underwriters' Laboratories requirements for label indicated. Provide core specified or mineral core as needed to provide fire-protection rating indicated.
   1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
   2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.
   3. Pairs: Provide formed-steel edges and astragals.
      a. Finish steel edges and astragals with baked enamel same color as doors.

b. Finish steel edges and astragals to match door hardware (locksets or exit devices).

G. Solid Core Doors: Structural Composite Lumber, 1 3/4" thick solid core Extra Heavy Duty Wood doors with hardwood edge type-E conforming to AWI Section 9 for Type SCL 5-ply standards. Doors shall be manufactured by the hot-press method, bonding faces, crossbands and core together in a single operation with Type II waterproof resin glue.

H. Mineral-Core Doors:
   1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
   2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:
      a. 5-inch top-rail blocking.
      b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
      c. 5-inch midrail blocking, in doors indicated to have armor plates.
      d. 4-1/2-by-10-inch lock blocks, in doors indicated to have exit devices.
   3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.03 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Finish for Veneer-Faced Doors:
   1. Grade: Premium, with Grade AA faces.
   2. Species: White oak
   3. Cut: Rift cut.
   4. Match between Veneer Leaves: Book.
   5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
   6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions, and doors visible within the same room except for corridors.
   7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet or more.
   8. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
   9. Transom Match: Continuous match.
   10. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling. Comply with requirements in Division 06 Section "Interior Architectural Woodwork."

B. Interior Solid-Core Doors:
   1. Exposed Vertical and Top Edges: Same species as faces.
   2. Core: Either glued wood stave or structural composite lumber.
   3. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
   4. WDMA I.S.1-A Performance Grade: As indicated.
   5. Doors to have minimum STC rating equal to or greater than adjacent partition or greater if noted.

2.04 LOUVERS AND LIGHT FRAMES

A. Wood Louvers: Door manufacturer's standard solid-wood louvers unless otherwise indicated.
   1. Wood Species: Same species as door faces.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Air Louvers Inc.
   2. Anemostat; a Mestek company.
   3. Hiawatha Incorporated.
   4. L & L Louvers, Inc.

5. LL Building Products, Inc.; a division of GAF Materials Corporation.
6. Louvers & Dampers, Inc.; a Mestek company.

C. Metal Louvers:
1. Blade Type: Vision-proof, inverted V.
2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, factory primed for paint finish.

D. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire-protection rating of 1-1/2 hours and less.
1. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, factory primed for paint finish.

E. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.
1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

A. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

B. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; factory primed for paint finish and approved for use in doors of fire-protection rating indicated.

2.05 FABRICATION

A. Prefit and pre-machine wood doors at the factory.

B. Comply with the tolerance requirements of NWMA for prefitting. Machine doors for hardware requiring cutting of doors. Comply with final hardware scheduled and door frame shop drawings, and with hardware templates and other essential information required to ensure proper fit of doors and hardware.

C. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in the factory.

D. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
1. Fabricate door and transom panels with full-width, solid-lumber meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

E. Openings: Cut and trim openings through doors in factory.
1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Provide flush edgings for wood doors receiving panic devices or other hardware where typical molding would conflict with hardware. Coordinate with door hardware.
3. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
4. Louvers: Factory install louvers in prepared openings.

2.06 SHOP PRIMING

A. **Doors** for Transparent Finish: Shop prime doors with stain (if required), other required pretreatments, and first coat of finish as specified in Division 09 Section "Painting". Seal all four edges, edges of cutouts, and mortises with first coat of finish.

2.07 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
B. Finish doors at factory.
C. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
D. Transparent Finish:
   1. Grade: Premium
   2. Finish: AWI conversion varnish or catalyzed polyurethane system.
   3. Staining: Refer to Interior Finishes.
   4. Effect: Open-grain finish
   5. Sheen: Satin

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine doors and installed door frames before hanging doors.
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."
B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
C. Clearance Tolerances for Factory Fitted Doors: Align in frames for uniform clearance at each edge.
   1. Provide 1/8 inch at heads, jambs, and between pairs of doors.
   2. Allow maximum of 3/16" over threshold or saddle.
   3. Allow maximum of 1/2" over decorative floor coverings.
   4. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
D. Clearance Tolerances for Fire-Rated Doors: Install in accordance with NFPA 80 for fire rated doors, and the following maximum clearances, whichever is more stringent:
   1. 1/8" between door and frame.
   2. 3/8" between door bottoms and decorative floor finish.
   3. 1/8" between doors for pairs of doors.
   4. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.03 ADJUSTING

A. Operation: Re-hang or replace doors that do not swing or operate freely. Replace damaged material.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
C. Protect doors as recommended by door manufacturer to ensure that doors will not be damaged at time of Substantial Completion.

END OF SECTION 08 14 16

SECTION 08-3113 – ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. This Section includes the following:
   1. Provide all access doors and frames for walls and ceilings as indicated in Drawings and as required for access to equipment and by authorities having jurisdiction, whether or not locations for access doors and frames are specifically indicated in Drawings.
B. Related Sections include the following:
   1. Division 03 Section "Cast-in-Place Concrete" for blocking out openings for access doors and frames in concrete.
   2. Division 04 Section "Unit Masonry Assemblies".
   3. Division 05 Section "Metal Fabrications" for crawl space access ladders and miscellaneous steel reinforcement at new floor openings.
   4. Division 06 "Rough Carpentry" for coordination of wood blocking.
   5. Division 09 Section "Gypsum Board" for gypsum board assemblies.
   6. Division 09 Section "Acoustical Ceilings" for suspended acoustical tile ceilings.
   7. Division 09 Section "Ceramic Tiling".
   8. Division 23 Section "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.03 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
   1. Method of attaching door frames to surrounding construction.
   2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain access doors and frames of each type through one source from a single manufacturer.
B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the

following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. NFPA 252 for vertical access doors and frames.
2. ASTM E 119 for horizontal access doors and frames.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.05 COORDINATION

A. Verification: Coordinate with other trades to determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, electrical, or other concealed work.
1. Size panels as required by controls to be accessed. Provide adequate sizes to service equipment accessed by doors and panels, and acceptable to authorities having jurisdiction.
2. For replacement of access doors in existing construction, field measure to match existing opening sizes.

1.06 PRODUCT DELIVERY AND STORAGE

A. Deliver products in manufacturers original packages, clearly marked with brand name and model number.

1.07 WARRANTY

A. Manufacturer shall guarantee against defects in material and workmanship for a period of one year minimum.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Access Doors:
   a. Acoustical Products, Inc.
   b. Acudor Products, Inc.
   c. Bilco
   d. Babcock Davis
   e. J. L. Industries, Inc.
   f. Karp Associates, Inc.
   g. Larsen's Manufacturing Company.

2.02 WALL AND CEILING ACCESS DOORS AND PANELS

A. Access Door for use in noise critical spaces: Equal to Type RDW manufactured by Karp with applied 5/8” drywall panel and factory-optional 1/16” x 3/8’ neoprene gasket.

B. Ceiling Access Door where passage is required for service access at ceilings: Flush style Metal Access panel with perforated galvanized metal frame flanges for drywall tape and bedding, concealed non corroding two-point pin hinge, and cylinder lock & key, equal to Acudor Products, Inc., DW5040
1. Size: 30” x 30” where intended for passage, and sizes as required for intended service purpose in other locations.
2. Fire rated to match adjacent construction when located in fire rated construction.

3. Acoustically rated (STC 64 minimum) access door with drywall inlay where indicted and where located in an acoustically rated drywall partition, Acudor ACF-2064

C. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.
   1. Locations: Wall surfaces**.** Install at all locations where valves or controls are concealed within walls, whether shown on the drawings or not.
   2. Door: Minimum 0.060-inch thick, 16-gauge sheet metal, set flush with exposed face flange of frame.
   3. Size: 24” x 36” where intended for passage, and sizes as required for intended service purpose in other locations.
   4. Frame: Minimum 0.060-inch thick, 16-gauge sheet metal with nominal 1-inch-wide, surface-mounted trim.
   5. Fire rated to match adjacent construction when located in fire rated construction.
   6. Hinges: Continuous piano hinge.
   7. Latch: Screwdriver-operated cam latch.
   8. Finish:
      a. Satin stainless steel at tile, restrooms, and other wet locations.
      b. Shop primed steel for field applied painting in other wall locations. Color to match adjacent finish or per architect’s direction..Access door below is designed to have carpet or composition tile finishes applied in the field. Change Type designation to TER for ceramic tile or terrazzo finishes and increase molding height up to 1 inch.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas to receive door and frame to ensure work of preceding trades is completed. Check surfaces to see that they are plumb in place, free from grease, oil or other debris which would affect proper installation. Application constitutes acceptance of substrate conditions.

3.02 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.
B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.
D. Installation: All access panel locations in Noise Critical Spaces shall be installed only where indicated on drawings. Location of additional proposed access panels shall be submitted by Contractor for approval.

3.03 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.
B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

SECTION 08-3326 – OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Open-curtain overhead coiling grilles.
      a. Basis of Design Products
   2. Coiling Grille Operator
      a. Manual Operator
   3. Material Finishes
      a. Aluminum.
   4. Maintenance Service

B. Related Requirements:
   1. Division 04 Section "Unit Masonry Assemblies."
   2. Division 05 Section "Structural Steel" and "Metal Fabrications" for support framing and framed openings.
   3. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports, angle-framing of grille opening, corner guards, and bollards.
   4. Division 06 Section "Rough Carpentry" for wood blocking.
   5. Section 08 36 13 "Sectional Doors" for interlock of upward acting doors and overhead coiling grille controls
   6. Division 09 Sections on Painting for finish painting of factory-primed grilles.

1.03 REFERENCES

A. ASTM (American Society for Testing and Materials) Standards
   1. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   3. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
   4. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   5. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

B. NEMA (National Electrical Manufacturers Association) Standards
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
   2. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
   3. NEMA MG 1 - Motors and Generators.

1.04 COORDINATION

A. Coordinate Work with other operations and installation of adjacent finish materials to avoid damage to installed materials.

1.05 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling grille and accessory.
   1. Include construction details, material descriptions, dimensions of individual components, profiles for curtain components, and finishes.
   2. Provide Preparation instructions and recommendations, Storage and handling requirements and recommendations and Installation methods.

B. Submit Manufacturer's Product Safety Data Sheets for each product.

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include detailed plans, elevations, sections, mounting details, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials and construction.
   2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   4. For exterior components, include details of provisions for assembly expansion and contraction.
   5. Show locations of controls, locking devices, and other accessories.

D. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
   1. Include similar Samples of accessories involving color selection.

E. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
   1. Open-curtain grille with full-size components consisting of rods, spacers, and links as required to illustrate each assembly[**, including glazed inserts**].
   2. Guides.
   3. Brackets.
   4. Hood.
   5. Samples on metal at least 6 inch long, representing actual color.

F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Manufacturer Certificates: Certify products meet or exceed specified requirements.

C. Sample Warranty: For special warranty.

1.07 CLOSEOUT SUBMITTALS

A. Operating Manuals.

B. Maintenance Data: For overhead coiling grilles to include in maintenance manuals and schedule.

C. Warranties.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.09 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Coordination: Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials. Coordinate power and access control requirements and their rough-in locations with other trades.

1.10 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.

B. Distributor / Installer Qualifications: Doors shall be provided and installed by an Overhead Door Ribbon Distributor with at least the 5 previous years of continuous service as a distributor with a proven record of successful in-service performance, or equivalent qualifications if doors are provided by another Manufacturer. Submit statement of qualifications from the Manufacturer."
   1. Company specializing in performing Work of this section and approved by manufacturer, employing installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
   2. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

C. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

1.11 WARRANTY

A. Coiling Grill Warranty: Manufacturer's limited grill system warranty, to be free of defects in materials and workmanship for 3 years or 20,000 cycles, whichever occurs first.

B. Coiling Counter Grill Warranty: Manufacturer agrees to repair or replace components of grilles that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

C. Finish Warranty: Basis of Design Manufacturer's standard published warranty on finish indicated.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Source Limitations: Obtain overhead coiling grilles from single source from single manufacturer.

2.02 PERFORMANCE REQUIREMENTS

A. Operation Cycles: Grille components and operators capable of operating for not less than 50,000. One operation cycle is complete when a grille is opened from the closed position to the fully open position and returned to the closed position.

2.03 OPEN-CURTAIN GRILLE ASSEMBLY

A. Basis of Design Aluminum Security Grilles: Overhead Door Corporation Model 670.
   1. Curtain: Horizontal 5/16 inch (7.8 mm) diameter rods with network of vertically interlocking links to form a pattern. Bottom bar extruded aluminum tubular shape.

a. Material: Aluminum
b. Vertical Rod Spacing:
    1) 2 inches (51 mm) on center, straight lattice
c. Pattern:
    1) Straight lattice; horizontal spacing 6 inches (152 mm) on center.
d. Finish: Aluminum bronze anodized.
e. Bottom Bar: Tubular extruded aluminum, bronze anodized.
f. Guides:
    1) Extruded aluminum shapes with retainer grooves and continuous silicone treated wool-pile strips or PVC inserts to reduce noise and assist operation
        a) Guides face mounted on adjacent construction.
        b) Finish: Bronze anodized.
g. Brackets: Minimum 3/16 inch (4.8 mm) steel to support barrel, counterbalance and hood as applicable.
    1) Finish: PowderGuard Premium powder coat, black.
h. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with maximum deflection of 0.03 inches per foot of span. Counterbalance adjustable by means of an adjusting tension wheel.
i. Hood: Aluminum, mill finish with intermediate supports as required.
j. Manual Operation: Chain hoist.

2.04 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

A. Open-Curtain Grilles: Fabricate metal grille curtain as an open network of horizontal rods, spaced at regular intervals, that are interconnected with vertical links, which are formed and spaced as indicated and are free to rotate on the rods.
    1. Aluminum Grille Curtain: ASTM B221 (ASTM B221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Bottom Bar: Manufacturer's standard continuous shape unless otherwise indicated, finished to match grille.
    1. Astragal: Equip grille bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

C. Grille Curtain Jamb Guides: Manufacturer's standard shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.

2.05 HOODS AND ACCESSORIES

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
    1. Aluminum: 0.040-inch- (1.02-mm-) thick aluminum sheet, complying with ASTM B209 (ASTM B209M), of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.

B. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

2.06 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
    1. Lock Cylinders: As standard with manufacturer and keyed to building keying system.

2. Keys: Three for each cylinder.

C. Chain Lock Keeper: Suitable for padlock.

2.07 COUNTERBALANCE MECHANISM

A. General: Counterbalance grilles by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of parts and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.08 MANUAL GRILLE OPERATORS

A. General: Equip grille with manual grille operator by grille manufacturer.

B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf (111-N) force for grille operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.09 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.10 ALUMINUM FINISHES.

A. Mill Finish: Manufacturer's standard.

B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

C. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.11 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports, according to manufacturer's written instructions and as specified.

B. Install overhead coiling grilles, hoods, controls, and operators at the mounting locations indicated for each grille.

C. Accessibility: Install overhead coiling grilles, switches, and controls along accessible routes in compliance with the accessibility standard.

3.03 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.04 ADJUSTING

A. Adjust hardware and moving parts to function smoothly, so that grilles operate easily, free of warp, twist, or distortion.
   1. Adjust exterior components to be weather resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.05 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service is to include 12 months' full maintenance by skilled employees of coiling-grille Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper grille operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.
   1. Perform maintenance, including emergency callback service, during normal working hours.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling grilles.

END OF SECTION 08 33 26

SECTION 08-3613 – UPWARD ACTING SECTIONAL DOORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide Upward Acting Sectional Door assemblies including brackets, guides, tracks, hardware, operators and installation accessories.

B. Related Sections include the following:
   1. Division 04 Section "Unit Masonry Assemblies."
   2. Division 05 Section "Structural Steel Framing" , for miscellaneous steel at perimeter of openings for attaching overhead doors.
   3. Division 08 Section "Door Hardware."
   4. Division 08 Section "Glazing."
   5. Division 09 Section "Painting."
   6. Division 26 Section "Electrical."

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall be a Manufacturer-authorized distributor / installer for the doors as specified, with minimum 5 years continuous operation under the same company name, and able to demonstrate a record of successful in-service performance of installed doors of the same type as specified.

B. Certifications: From Installer, that the installed doors will meet air infiltration requirements as required by local code, or as herein specified, whichever is more stringent.

C. Doors Design Criteria: Door system designed to withstand external or internal wind loads of 20 psf, and also wind loading as required per local code requirements, whichever is greater. Maximum deflection shall not exceed l/120 of the span.
   1. Design and install doors and seals to perimeter construction as required to prevent air leakage to meet or exceed local code requirements and IECC 2015: 0.40 CFM/ft^2 or less, per ANSI/DASMA 105, NFRC 400, or ASTM E 283 at 1.57 psf.

D. Controls Design Criteria for Fire Station Apparatus Bays: Design and provide complete controls for Sectional Doors. Specified control units are to establish quality and performance criteria, and does not guarantee that this sequence of operation can be achieved without other external controls and interface:
   1. Each Sectional door, shall be controlled individually by radio frequency controls at frequency to match existing fire stations. Provide a supplementary external receiver using the Fire Department's frequency if the required frequency does not come as a standard option of the operator. Rear bay door receivers do not need to also include an exterior wall mounted long-range as at the Four-Fold front bay doors. Radio reception shall be tested to have proper reception from approaching apparatus, to the satisfaction of the Fire Department.
      a. The controls shall work by **3-button** transmitter, as applicable for each bay. Transmitters shall be individually programmable to work with the existing controls for their existing fire stations, such that the same transmitters can be used at any Fire Station to open the doors for the same apparatus types as assigned by the Fire Department. (Example: Command, Ambulance, Engine, Aerial, etc).

2. This sequence of operations applies to rear apparatus bays. For controls sequence of operations for four-fold doors , refer to Division 08, Section "Electric Operated Four-Fold Doors".
3. Coordinate door, hardware, utilities, supports and mechanical systems of various manufacturer's products specified before product submittals to insure a complete functional system that will operate per the systems description.

1.04 SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.
   1. Submit manufacturer's product literature and color selection chart.
   2. Include construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
   3. For power-operated doors, include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop drawings and details based on the Contract Documents shall be submitted to the Architect for review prior to ordering of materials.
   1. Include plans, elevations, sections, and mounting details.
   2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
   4. Include diagrams for power, signal, and control wiring.

C. Delegated Design Submittal:
   1. Controls: Construction Manager's certification, and controls wiring and schematics by Construction Manager's designated responsible party(ies) as required, achieving the sequence of operation as specified.

D. Informational Submittals:
   1. Qualifications, for Installer.
   2. Certifications.

E. CLOSEOUT SUBMITTALS
   1. Maintenance Data: For sectional doors to include in maintenance manuals.
   2. Manufacturer's warranty.
   3. Finish warranty.

1.05 PROJECT CONDITIONS

A. Coordinate shop drawings and installation of overhead doors with other mechanical equipment, plumbing, and lighting in the apparatus bay. Inform architect of any conflicts.

B. Install door to seal to perimeter construction as required to prevent air leakage in excess of local code requirements.

C. Provide all bracing and supports for tracks as required for complete installation.

1.06 WARRANTIES

A. Door Manufacturers' standard warranties.
   1. Include door manufacturer's 3-Year / 20,000 cycle Warranty on door.
   2. Standard warranties for finishes specified:
      a. Anodized Finish: 5 years.
      b. Painted Finish: 15 years.

B. Operator: Manufacturer's standard 2-year limited warranty against material and manufacturing defects.

C. Installer's Warranty: Installation shall be warranted by installer for a period of one year against defects in materials and workmanship.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Sectional Doors: Basis of Design: Design for overhead doors is based on products as manufactured by Overhead Door Company.

B. Operators: Provide Liftmaster operators as specified, or approved equal product

C. Source Limitations:
   1. Obtain all doors , and related hardware and other accessories from a single manufacturer.
   2. Obtain all operators, and related hardware and other accessories from a single manufacturer.

2.02 MATERIALS

A. Upward Acting Sectional Doors: Prefinished, aluminum with glazing, Aluminum Model 521 as manufactured by Overhead Door Corporation, or approved equal.
   1. Track: 3", standard lift.
      a. Unless otherwise indicated, also provide all miscellaneous steel fabrications as required for complete, secure, and rigid attachment and support of tracks as required to provide for smooth, trouble-free operation of the door system.
      b. Where required by wall construction, provide ¼" bent plates to comply with Division 05 Section "Metal Fabrications" for connection of tracks to adjacent steel or 8" or larger size CMU structure. Do not support tracks from masonry veneers or other finish materials.
   2. Door Assembly: 6063-T6 Aluminum stiles and rails.
      a. Panel Thickness: 1 ¾"
      b. Top and Bottom Rail Width: 3-3/4"
      c. Aluminum Panels: 0.050 aluminum, finish to match rails and stiles. Aluminum panels in color as selected by Architect.
      d. Glazing: 1" low-E coated, tinted tempered insulating glass equal to Glass Type #3 as specified in Specification Section 08 80 00 Glazing.
   3. Weatherseals: Bottom, flexible PVC. Side and top gaskets as required to seal against air leakage in compliance with local code requirements.
      a. EPDM bulb-type strip at bottom section.
      b. Flexible Jamb seals.
      c. Flexible Header seal.
   4. Finish: Kynar coated, **RAL 7022.**
   5. All exposed fasteners, anchors, hardware or attachments shall be galvanized, cadminum-plated or stainless steel.
   6. Heavy-duty higher-cycle springs for 50,000 cycle rating.
   7. Electric motor Model GH – Gearhead Hoist Operator for Standard Lift Sectional Doors, rated for continuous duty, cULus listed and cULus labeled, internal auxiliary reversal circuit, conduit-encased wiring from control circuit to motor, and accessories required for proper operation; operator shall be capable of driving door at a speed of approximately 11 to 12 inches per second. Operators as manufactured by Chamberlain LiftMaster, The Chamberlain Group, Inc. Oak Brook, IL, 800-528-5880 (no substitutions without prior approval of Architect). Provide the following components:
      a. Primary Drive Reduction: Wormgear-in-oil-bath gear reducer with synthetic "All Climate" oil with 20:1 speed reduction; adjustable torque limiter and quick-disconnect door arm to facilitate manual operation; permanently lubricated ball bearings on output shaft and output and door driven sprockets.
      b. Brake: Electric solenoid-actuated brake that is capable of stopping and holding a door at any position.
      c. Limit Switches: Fully adjustable, linear-driven limit mechanism synchronizing operator with door; low-friction nylon limit nuts fitted on treaded steel shaft that rotates on oil-tight self-lubricating bronze bushings; motor shall be removable without affecting limit switch settings.
      d. Electric Motor: High-starting torque, continuous-duty, industrial-type protected against overload by current sensing and thermal overload devices.
         1) 3/4 hp motor.
         2) 115 VAC operation.

e. LiftMaster Logic 5.0 motor control, UL-approved microprocessor solid-state type and shall include the capability to select one of 7 wiring types; additional features shall include a maintenance alert diagnostic system, programmable Timer-to-Close with timer defeat input, mid-stop programming capabilities and a maximum run timer to provide motor overrun protection; motor control shall be housed in a NEMA 1 enclosure integral to the operator and shall conform to ANSI/NEMA ICS 6.
   1) Radio Receiver: LiftMaster Logic 5.0 on-board, 3-channel receiver with standard external antenna; equipped to accept Security+ 2.0 Rolling Code Technology remote controls and trinary DIP switch remote controls, with memory up to (30) 3-button remote controls, plus 30 wireless keypads, or an unlimited number of trinary DIP switch remote controls. Tri-band frequency (310/315/390 MHz) sends multiple radio signals to bypass radio interference.

f. Push-button operated control stations: Heavy Duty, surface mount type with open, close, and stop buttons for interior wall mounting over recessed electrical box in wall shall be NEMA Type 1 with maintenance alert indicator to signal intervals for routine door and operator maintenance. Provide number and locations as indicated on drawings.
   1) Where installed in banks of buttons, coordinated with electrician to arrange button controls in a grid pattern, to receive signage indicating the bay (bay 1, 2, etc. arranged horizontally) and the type or location of doors (each bay's controls arranged vertically in columns, from front control on top to rear bay control below).

g. Safety Equipment:
   1) NEMA 4X Monitored Photo Sensors: LiftMaster CPS-OPEN4 Monitored Photo Eyes (commercial thru-beam) and CPS-RPEN4 Monitored Retro-reflective Photo Eyes, fully monitored, non-contact, photo beam reversing photo sensor system with NEMA 4X watertight/corrosion-resistant enclosure shall reverse, in conjunction with the operator, a closing door to the full open position when an obstruction is sensed; photo sensors shall be mounted no higher than 6 inches maximum above the floor.
      a) Provide a second set of beam sensors per opening at 3'-0" or other elevation as directed by the Fire Department, to detect interference of high clearance to ground apparatus such as fire engines and ladder trucks. Confirm desired mounting elevations for each opening with Fire Department representative in field.
   2) NEMA 6 Monitored Optical Edge System (OES): Shall provide a means to attach a 2-wire monitored sensing edge to a LiftMaster Logic 5.0 operator for continuous monitoring purposes; the edge, in conjunction with operators, shall reverse a closing door to the full open position when an obstruction is sensed; sensing edge ordered separately and can be field-cut to required length.
   3) Traffic Lights: Provide Red/Green traffic lights: "LiftMaster" RGL24LY, with TLS1CARD for traffic light control. Provide traffic lights in following locations:
      a) Interior side of apparatus bay doors .
      b) Locate all traffic lights on the driver side of each overhead door, as determined by the apparatus facing the opening. Confirm with Fire Department representative if the rear bay doors of pull-through bays should be located for apparatus facing the door, or for backing out.

8. Manual Override Operation: Chain Hoist.
9. Lock: Operator does not allow manual operation except by manual chain override.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin installation until openings have been properly prepared.

B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer’s printed instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Overhead door shall be mounted to inside face of wall with tracks braced to ceiling in accordance with manufacturer's recommendations for a track installation. Securely support and brace door tracks suspended from structure. Secure tracks to structural members only. Door, when installed, shall fit flush, tight and level to floor construction with side jambs properly plumbed and supported to meet design criteria. Provide all accessory brackets and shims as may be necessary for a complete installation.

3.04 ADJUSTING AND CLEANING

A. Completed door shall have all mechanisms properly adjusted and lubricated. Unit set tight to wall and weatherstrips installed to properly close off opening.
   1. Doors shall open and close smoothly, without jerks or binding, and without excessive vibration or lateral movements while in motion that could shorten the operating life of the door or operator.

B. Clean doors in accordance with Manufacturer’ instructions, using materials and methods that will not damage parts of finishes.

C. Protect installed doors until project completion.

3.05 TESTING, DEMONSTRATION AND TRAINING

A. Fully test operation of the doors prior to owner demonstration and training. Demonstrate operation to Owner’s satisfaction during Owner demonstration and training. Testing shall include but is not necessarily limited to the following:
   1. Test and demonstrate each door for smooth operation.
      a. If each door does not operate smoothly, make required adjustments and repeat demonstration for those doors after corrections are made.
   2. Test and demonstrate radio control reception to the required distance for each receiver and door.
      a. In the event that reception is unsatisfactory, make required adjustments and repeat demonstration for those doors after corrections are made.
   3. Test door safety devices for proper function. Make adjustments as required.
   4. Test other controls and control interlocks for proper function, as applicable.
   5. Test that operating all doors simultaneously does not trip breakers.

B. Conduct training of Owner's personnel in compliance with Division 01, Section "Demonstration and Training".
   1. Include time-to-close programming and other programmable functions in Owner training.

END OF SECTION 08 36 13

SECTION 08-4113 – ALUMINUM ENTRANCES & STOREFRONT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide storefront (including aluminum doors and hardware), framing complete with glazing as shown on the drawings and as herein specified.
B. Related Sections:
   1. Division 05 Section - "Metal Fabrications".
   2. Division 06 Section - "Rough Carpentry".
   3. Division 06 Section - "Quartz Countertops and Stools".
   4. Division 07 Section - "Thermal Insulation".
   5. Division 07 Section - "Sheet Metal Flashing and Trim".
   6. Division 07 Section - "Joint Sealants".
   7. Division 07 Section - "Firestopping".
   8. Division 08 Section - "Metal Windows", for manufactured window units.
   9. Division 08 Section - "Window Security Screens".
   10. Division 08 Section - "Door Hardware".
   11. Division 08 Section - "Glazing".
   12. Division 12 Section - "Window Treatments".

1.03 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
B. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
   1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
   2. Dimensional tolerances of building frame and other adjacent construction.
   3. Failure includes the following:
      a. Deflection exceeding specified limits.
      b. Thermal stresses transferring to building structure.
      c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
      d. Glass breakage.
      e. Noise or vibration created by wind and by thermal and structural movements.
      f. Loosening or weakening of fasteners, attachments, and other components.
      g. Sealant failure.
      h. Failure of operating units.
C. Structural Loads:
   1. Wind Loads: As required by authorities having jurisdiction.

2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members:
   1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
   2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.
      a. Operable Units: Provide a minimum 1/16 inch clearance between framing members and operable units.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
   1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
   2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
   3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

F. Air Infiltration:
   1. Fixed Framing: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 psf.
   2. Entrance Doors: Maximum air leakage of 1.0 cfm/sq. ft. for pair of doors, and maximum of 0.5 cfm/sq. ft. for a single door, at a static air pressure differential of 6.24 psf.

G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 8 psf.

H. Energy Performance: Certify and label energy performance according to NFRC as follows:
   1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.36 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
   2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.

I. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
   2. Interior Ambient-Air Temperature: 75 deg F.

J. Brake Metal: Provide in thicknesses as required to prevent oil canning, including for exterior brake metal oil canning that may be caused by design wind loads. Additionally, thickness may be greater but shall not be less than minimum thicknesses as specified elsewhere in these specifications, or minimum thicknesses as indicated in Drawings. Contractor shall include necessary thicknesses in his bid.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Shop drawings and details based on the Contract Documents submitted to the Architect for review. Include plans, elevations, sections, full-size details, and attachments to other work. Show connection to and continuity with adjacent thermal, weather, and air barriers.

D. Samples for initial Selection: Manufacturer's standard color selector sheets or factory applied selector plates. Website or print media other than Manufacturer's provided materials do not represent accurate color renditions and are not acceptable.
E. Samples for verification:
   1. Submit three samples of each required aluminum finish on aluminum plates or extrusions.
F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, door hardware, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware. Submit for concurrent review with other door and hardware submittals.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.
C. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
   1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront. Compliant with local code requirements and as specified herein, whichever is more stringent.
D. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency, or by a qualified testing agency.
E. Sample Warranties: For special warranties.

1.06 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.07 QUALITY ASSURANCE

A. Fabricator and Installer: Shall have a minimum of 5 years experience on projects of similar size and scope. Installer shall be approved by Manufacturer.
B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate typical construction and waterproofing details, and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockups at typical wall locations as located by Architect. Approved mockups may become part of the final work if undisturbed at Substantial Completion.
   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
B. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle material and components to avoid damage. Protect curtain wall material against damage from elements, construction activities, and other hazards before, during and after curtain wall installation.

1.09 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 GUARANTEE AND WARRANTY

A. Installer shall submit a written guarantee to the Owner, guaranteeing storefront system for a period of 2 years against leaks and defects in the system.
B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Structural failures including, but not limited to, excessive deflection.
   2. Noise or vibration caused by thermal movements.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Water leakage through fixed glazing and framing areas.
   5. Failure of operating components.
   6. Warranty Period: Five years from date of Substantial Completion.
C. Door manufacturer's warranty shall provide for a period of **[2][5][10]** years from date of Substantial Completion. All hardware installed by manufacturer shall be covered by warranty.
D. Manufacturer's Finish Warranty: Manufacturer's standard limited warranty against fade, chalk, crack, check, peel, and failure of coatings to adhere to metal. Warranty duration as follows:
   1. Anodic Finish: 10 years from date of delivery.

1.11 MAINTENANCE MATERIALS

A. Entrance Door Hardware:
   1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: 1-3/4" x 4-1/2" storefront glazing system, thermally broken at exterior. Subject to compliance with requirements, provide EnCORE Framing System as manufactured by Kawneer Company, or comparable product by one of the following:
   1. EFCO Corporation.
   2. Oldcastle Building Envelope.
   3. CRL - US Aluminum.
   4. YKK AP America.

2.02 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Sheet and Plate: ASTM B 209.
   2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   3. Extruded Structural Pipe and Tubes: ASTM B 429.
   4. Structural Profiles: ASTM B 308/B 308M.
   5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and

pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.03 FRAMING SYSTEMS

A. Framing Members and Brake Metal Fillers: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
   1. Construction: Thermally broken at exterior framing, non-thermal broken at building interior.
   2. Glazing Plane: Front
B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
   2. Reinforce members as required to receive fastener threads.
   3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system, fabricated from stainless steel.
D. Aluminum subsills: Provide Manufacturer’s subsills where framing sits on slab, and other locations as required by Manufacturer. Manufacturer’s subsill does not constitute a substitute for the continuous aluminum sill flashing with end dams as indicated in Drawings. **Provide in addition to manufacturer’s subsill continuous aluminum sill flashing with end dams whether noted in the drawings.**
E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
G. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.04 GLAZING SYSTEMS

A. Glazing: As specified in Division 8 Section "Glazing."
B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.05 ENTRANCE DOOR SYSTEMS

A. Thermally Broken Entrance Doors (Exterior Doors): Basis of Design – Kawneer 450T Insulpour Thermal Entrance doors for manual-swing operation.
   1. Door Construction: Minimum of 1-3/4-inch overall thickness, with minimum 0.125-inch thick, extruded-aluminum tubular rail and stile members, with glazing pockets sized for specified insulated glazing. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
   2. Door Design: Wide stile; 5-inch nominal width.
   3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
      a. Provide nonremovable glazing stops on outside of door.
B. Entrance Door Hardware: Factory install entrance door hardware provided by Manufacturer to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes

1. Weather-stripping / gasketing: Manufacturer's standard replacement stripping of molded neoprene gaskets complying with ASTM D-2000. At exterior doors, provide compression weather stripping. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
3. At double doors specified to receive removeable mullions, provide filler blocks as required for complete support above removable mullion top brackets.
4. Refer to Division 08, Section "Door Hardware" for more information.
5. Reinforce doors as required for installing entrance door hardware.

2.06 ACCESSORY MATERIALS

A. Aluminum Trim: Provide brake metal trim in locations specifically shown in Drawings and other locations as required for complete installation. Thicknesses indicated in Drawings and specifications are minimum thicknesses regardless of minimum thickness to prevent oil canning. Provide greater thickness than indicated minimum thicknesses where required to prevent oil canning. Contractor is responsible to determine required thicknesses per delegated design requirements (refer to Part 1 of these specifications).
B. Aluminum Sills: Where indicated in Drawings, (or where sill dimension is too small for solid surface, quartz), provide interior aluminum window sills with nominal 2” vertical return at inside face of wall, hemmed bottom edge, and hemmed and closed ends. Match finish of adjacent window.
C. Anchoring Devices: Provide plates, angles, steel frame bracing, wind bracing, spacers, clips and other devices necessary to support aluminum framing and glass. Design of connections shall be fabricator's responsibility. Submit shop drawing for approval.
D. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 7 Section "Joint Sealants."
   1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
E. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.
F. Security Screens: Refer to Division 08, Section "Security Screens".

2.07 FABRICATION

A. Form or extrude aluminum shapes before finishing.
B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Profiles with solid back extrusions, or with filler plates, as required to receive membrane flashings at jamb flashings (locations where metal jamb flashing is not otherwise indicated).
   3. Accurately fitted joints with ends coped or mitered.
   4. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
   5. Physical and thermal isolation of glazing from framing members.
   6. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   7. Provisions for field replacement of glazing from exterior.
   8. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.08 ALUMINUM FINISHES

A. Factory Finishing:
   1. Kawneer Permacoat AMMA 2604, Powder Coating
      a. Color: **Smoke Gray**
B. Miscellaneous Steel Bracing (Concealed): One (1) shop coat of red oxide primer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:
   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
   6. Seal joints watertight unless otherwise indicated.
B. Metal Protection:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
D. Set continuous sill members and flashing in full sealant bed as specified in Division 7 Section "Joint Sealants" to produce weathertight installation.
E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
F. Install glazing as specified in Division 8 Section "Glazing."
G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
   1. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
H. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" to produce weathertight installation.
I. Prepare windows for installation of security screen.

3.03 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
   1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
   2. Alignment:
      a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
      b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.04 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
B. Field Quality-Control Testing: Perform the following test on mockups and representative areas of glazed aluminum curtain walls.
   1. Air Infiltration: ASTM E 783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-airpressure differential of 1.57 lbf/sq. ft.
      a. Mockups: Test mockups.
      b. Representative Areas: For each system type, perform a minimum of three tests in areas as directed by Architect.
      c. Failed Tests: Perform one additional test at location selected by Architect for each failed test.
   2. Water Penetration: ASTM E 1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water infiltration to the building interior; any water intrusion to the building interior is a test failure.
      a. Locations: Same areas as air infiltration tests.
      b. Failed Tests: Perform one additional test at location selected by Architect for each failed test.
C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.
   1. Test a minimum of five areas on each building facade as directed by Architect.
   2. Repair installation areas damaged by testing.
D. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.
   1. Submit reports for each inspection, describing problems observed and corrections made.
E. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.05 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
   1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

3.06 PROTECTION AND CLEANING

A. Protect aluminum framing and/or doors during construction by masking members with approved cardboard and paper as recommended by manufacturer. Take particular care in protecting openings and doors from damage during construction.
B. Upon completion, remove trimmings and other debris. Replace broken, scratched, chipped or other damaged glazing. Remove excessive sealant, mastic and other marks from adjacent surfaces, and wash with clean water. Cleaning of glazing must be done in strict compliance with manufacturer's recommendations.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the construction period.

END OF SECTION 08 41 13

SECTION 08-5100 – METAL WINDOWS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Encompasses the furnishing of all materials and equipment and performing of all labor required to complete the window work and replacement window work as indicated on the Drawings, as specified herein, or both.
B. Related Sections include the following:
   1. Division 4 Section “Masonry.”
   2. Division 6 Section “Wood Blocking.”
   3. Division 8 Section “Security Screens.”
   4. Division 9 Section “Gypsum Wallboard.”

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver windows to project site in undamaged condition.
B. Store windows out of contact with ground.
C. Keep windows under weathertight covering and protect against damage.

1.04 PROTECTION

A. Handle to avoid injury to persons and to avoid damage to materials or to work in place. Satisfactorily repair or remove and replace work that has been damaged at no additional cost to the Owner.

1.05 PERFORMANCE REQUIREMENTS

A. General Performance: Alumnimun-framed window system shall withstand the effects of the following performance requirements without failure due to defective manufacture, fabrication, or other defects in construction.
B. Window System Performance Requirements:
   1. Performance Requirements: Provide aluminum windows of performance indicated whtat comply AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS)
      a. Performance Class and Grade: AW-PG100 – 60” x 99” (1524mm x 2515 mm)-FW
   2. Air Leakage: The test specimen shall be tested in accordance with ASTM E 283. The air leakage rate shall not exceed 0.10 CFM/ft2 (0.52 L/s*m2) at static pressure differential of 6.2 psf (300Pa)
   3. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331 and ASTM E 547. There shall be no leakage as defined in the test method at a static air pressure differential of 12 psf (574 Pa).
   4. Uniform Load Deflection: A minimum static air pressure difference of 100 psf (4788 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no defelction in excess of L/175 of the span of any framing member.

5. Uniform Load Structural Test: A minimum static air pressure of 150 psf (7182 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. The unit shall be evaluated after each load.
6. Component Testing: Window components shall be tested in accordance with procedures described in AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS).
7. Energy Efficiency:
    a. Thermal Transmittance Test (U-Factor): When tested in accordance with AAMA 1503, the conductive thermal transmittance (U-Factor) shall be no more than:
        1) U-Factor not more than .48 BTU/hr/sf/F per AAMA 507 or NFRC 100 when using project specified glass.
    b. Condensation Resistance Test (CRF): When tested to AAMA Specifcation 1503, the condensation resistance factor shall not be less than (CRF) 67(frame) and 66 (glass).
    c. Thermal Barrier Tests: Testing shall be in general accordance with AAMA 505 Dry Shrinkage and Composite Thermal Cycling test procedure, AAMA TIR-A8, Structural Performance of Composite Thermal Barrier Systems.
    d. Environmental ProductDeclarations (EPD): Shall have a Type III Product Specific EPD created from a Product Category Rule specific to North America.

1.06 SUBMITTALS

A. Shop Drawings: Complete detailing showing placement and erection plans; all member sizes, locations, anchorages, connections and methods of assembly. Contractor shall review and verify these shop drawings, then submit to Architect for approval. Review Architect comments on submittals prior to fabrication.
B. Samples: Submit one complete unit of each type, in finish specified, for use in mockup panel.
C. Product Data: Submit manufacturer's product literature for glass and sealant products.
D. Certification: Submit manufacturer's certification and test reports that materials and systems meet specification requirements and design criteria.

1.07 WARRANTY

A. Provide Owner a written warranty, signed by an officer of manufacturing company providing windows, that shall warrant completed system to be free of leaks and defects in material and workmanship for a period of 2 years after acceptance.

1.08 QUALITY ASSURANCE

A. Installer Qualifications: An installer which has had successful experiences with installation of the same or similar units required for this project and other projects of similar size and scope.
B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows whtat meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports and calculations.
C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.
D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 01 “ Product Requirements.” Do not modify size and dimensional requirements.
    1. Do not modify intended aesthetic effects, as judged soley by Architect, except with Architect’s approval. If modifications are proposed, submit somprehensive explanatory data to Architect for review.
E. Mockups: Build mockups to verify selections made under sample submittal and to demonstrate aesthetic effects and set quality standards for materials and execution.
    1. Build mockup for typ-e(s) of windows(s) indicated, in location(s) shown on Drawings.
F. Pre-Installation Conference: Conduct conference at Project site to comply with requirements.

1.09 PROJECT CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 EXAMINATION

A. Examine areas that are to receive windows. Report unsatisfactory conditions.
B. Do not start installation of windows until unsatisfactory conditions have been corrected.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Fixed Thermally Broken Windows
   1. Basis of Design
      a. Series 8400TL Thermal Windows as provided by Kawneer.
      b. Model No.: 8410TL Fixed Window
      c. 4” frame depth
      d. AW-PG100-FW
      e. Provide with:
         1) Strap Anchor: 245458
         2) Sub Sill: Depth as Required.
B. Operable Thermally Broken Window
   1. Basis of Design
      a. Series 8400TL Thermal Windows as provided by Kawneer.
      b. Model No.: 8430TL Single Hung Window
      c. 4” frame depth
      d. AW-PG70-H
      e. Provide with :
         1) Strap Anchor: 245459
         2) Sub Sill: Depth as Required.
         3) Insect Screens
            a) Extruded Aluminum frames, 6063-T6 ally and temper, joined at corners: 18x16 mesh aluminum screen cloth, frames finished to match aluminum windows; splines shall be extruded vinyl, removable to permit rescreening.

2.02 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070” (1.78 mm) wall thickness at any location for the main frame and sash members.
B. Thermal Barrier:
   1. Thermal Barrier: The thermal barrier shall be Kawneer IsoLock with a nominal 3/8” (9.53 mm) separation consisting of a two-part, chemically curing high density polyurethane which is mechanically and adhesively bonded to the alumnium.
C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickle/chrome plated steel with ASTM B 456 for Type SC 3 servere service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 server service conditions; provide sufficient strength to withstand design pressure indicated.
F. Sealant: For sealants required within fabricated windows, provide window manufacturer's standare, permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

2.03 GLAZING

A. Glass and Glazing Materials: Refer to Division 8 Section "Glazing" for glass units and glazing requirements applicatble to galzed aluminum window units.
B. Glazing System: Glazing method shall be a wet/dry type in accordance with manufacturer's standards. Exterior glazing shall be silicone back bedding sealant. Interior glazing shall be snap-in type glazing beads with an interior gaskey in accordance with AAMA 702 or ASTM C684.

2.04 HARDWARE

A. Mutin Grids:
   1. Applied Mutins.
B. Single Hung Window Typical Hardware:
   1. Sash Balances: A Class 1 spring balance with stainless steel or other corrosion-resistant components.
   2. Handle: Continuous, integral, bottom sash lift handle.
   3. Sash Lock: Zinc die cast cam-action sweep lock and keeper on meeting rails. One or two per sash as required by size. Powder coating finish to match window.
   4. Aluminim Auto Lock

2.05 FABRICATION

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fit joints; make joints flush, hairline and weatherproof.
   3. Means to drain water passing joints, condensation within framing members, andmoisture migraing withing the system to exterior.
   4. Physical and thermal isolation of glazing from framing members.
   5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   6. Provisions for field replacement of glazing.
   7. Fasteners, anchors, and connection devices that are conealed from view to gratest extent possible.
B. Window Frame Joinery: Screw Spline, factory sealed frame corner joints.
C. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
D. Fabricate aluminum windows that are re-glazable without dismantling framing.
E. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.
F. Sub Frames: Provide sub frames with anchors for window units as shown., of profile and dimensions indicated but not less than 0.093-inch (2.4 mm) thick extruded aluminum. Miter or

cope corners, and join with concealed mechanical joint fasteners. Finish to match window units. Provide sub frames capable of withstanding design loads of window units.

G. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section “Glazing” and with AAMA/WDMA/CSA 101/I.S.2/A440-08 (NAFS).
H. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section “Glazing” and glazing system indicated. Provide glazing stops to match frame.

2.06 ALUMINUM FINISH

A. Factory Finishing:
   1. Kawneer Permacoat AMMA 2604, Powder Coating
      a. Color: Smoke Gray

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight window installation.
   1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
   2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of opening.
   3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
   4. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Erection shall be by skilled mechanics. All windows shall be erected in accordance with manufacturer's instructions and the approved shop or erection drawings. Set windows at proper elevation & location;, plumb, level and in alignment. Properly brace frames to prevent distortion and misalignment. Protect ventilators and operating parts against accumulation of other building materials.
B. Apply protective material where aluminum windows contact dissimilar metals, concrete or mortar.
C. Sealants: Windows shall be caulked and sealed by installer to provide weather-tight installation around perimeter of window frame and wall opening. Color shall match window frame color.

3.03 CLEANING AND REPLACEMENT

A. All glass and metal shall be thoroughly washed. Remove all paint, mortar, labels, etc. and replace with new any scratched, broken or otherwise defective glass or metal.

END OF SECTION 08 51 00

SECTION 08-7100 – DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide all finish hardware including door locks, lock cylinders, construction cores and final cores as required to complete all door work and other work described herein or on the drawings.
B. Related Sections include the following:
   1. Division 6 Section “Rough Carpentry.”
   2. Division 8 Section “Aluminum Entrances.”
   3. Division 8 Section “Hollow Metal Doors.”
   4. Division 8 Section “Wood Doors.”
   5. Division 8 Section “Prefinished Wood Doors.”
   6. Division 8 Section “Rolling Doors and Grilles.”
   7. Division 10 Section “Signage.”
   8. Division 13 Section “Lead-lined doors.”
   9. Division 28 Section for coordination with other components of electronic access control system.
C. Mechanical and electrified door hardware for:
   1. Swinging doors.
   2. Gates.
D. Electronic access control system components, including:
   1. Electronic access control devices.
E. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
F. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier’s responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

1.03 REFERENCES

A. References specified in this section subject to compliance as directed:
   1. NFPA-80-1999 - Standard for Fire Doors and Windows
   2. NFPA-101-2003 - Life Safety Code
   3. IBC 2009 - International Building Code
   4. ADA - The Americans with Disabilities Act - Title III-Public Accommodations
   5. ANSI-A117.1-American National Standards Institute - Accessible and Usable Bldgs and Facilities
   6. ANSI-A156.5-American National Standards Institute - Auxiliary Locks and Associated Products
   7. UFAS - Uniform Federal Accessibility Standards
   8. UL - Underwriter's Laboratories, including UL-10B and UL-10C for Positive Pressure

9. WHI - Warnock Hersey International Division of Inchcape Testing Services
10. State and local codes including authority having jurisdiction.
11. DHI - Door and Hardware Institute
    a. Sequence and Format for the Hardware Schedule
    b. Recommended Locations for Builders Hardware
    c. Key Systems and Nomenclature

B. Door Hardware in this section shall meet the following as established by the American National Standards Institute, Inc. (ANSI) which is sponsored by the Builders Hardware Manufacturers Association, Inc., (BHMA). Product tests are to be administered by the ETL Testing Laboratories, Inc., or other official testing laboratories which have been designed by BHMA for the testing of ANSI standards latest revision will be in effect.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. FEMA P-361 2015 - Design and Construction Guidance for Community Safe Rooms.
3. ICC/IBC - International Building Code.
4. NFPA 70 - National Electrical Code.
5. NFPA 80 - Fire Doors and Windows.
6. NFPA 101 - Life Safety Code.
7. NFPA 105 - Installation of Smoke Door Assemblies.
8. State Building Codes, Local Amendments.

D. Standards: All hardware specified herein shall comply with the following industry standards:
1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

E. Listed Hardware*:* Hardware which is to be installed in or on fire labeled doors and frames, Class A or lesser, single or pairs shall be tested and listed by Underwriters Laboratories and/or Warnock Hersey Fire Laboratories Division. Exit devices which are to be used as panic hardware shall be tested and listed in Underwriters Laboratories "Accident Equipment List-Panic Hardware". All listed hardware shall be in compliance with National Fire Protection Association (NFPA) Standard Number 80 IBC current year adopted and be properly stamped or labeled for easy identification.

1.04 SUBMITTALS

A. Hardware Schedule: Submit complete hardware schedule (identifying each item as to manufacturer and number), shop drawings and product data to Architect for review prior to ordering of materials. This schedule shall be prepared using the "Sequence and Format for the Hardware Schedule" as approved and recommended by the Door and Hardware Institute (DHI). Include manufacturers cut-sheets on each item scheduled, coordinated with indexed letter or other designation as indicated in hardware schedule..
1. Submit data on closers indicating compliance with barrier-free codes.
2. Provide index summary sheet of all hardware to be used, cross-referenced to the cut sheets.
3. Confirm coordination with door lights, including resolving possible conflicts of mortised hardware or exit devices with locations of door lights as shown in Drawings. In the event of a conflict, include for Architect's consideration recommendations for a solution in compliance with applicable code requirements including Texas Accessibility Standards (TAS), for door lights requiring accessible height view (bottom of glass at 43" or lower).
4. Include confirmation and coordination with Owner's separate contracts for access control, security, and door bell and intercom systems for compatibility of hardware. Notify Architect in the event of conflict with specified hardware.
5. Include statement confirming coordination with overhead coiling doors, total glass entry doors, wire mesh partitions, fencing and other door systems as required for complete installation. Notify Architect in the event of apparent conflicts or duplications.
6. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door

and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

a. Door Index; include door number, heading number, and Architects hardware set number.
b. Quantity, type, style, function, size, and finish of each hardware item.
c. Name and manufacturer of each item.
d. Fastenings and other pertinent information.
e. Location of each hardware set cross-referenced to indications on Drawings.
f. Explanation of all abbreviations, symbols, and codes contained in schedule.
g. Mounting locations for hardware.
h. Door and frame sizes and materials.
i. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include operational descriptions for: egress, ingress (access), and fire/smoke alarm connections.
    1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

B. Product Data: Submit manufacturer's cut/catalog sheets on all hardware items and any required special mounting instructions with the hardware schedule.
C. Certification Compliance: Submit any information necessary to indicate compliance to all these specifications as required.
D. Templates: The hardware supplier shall provide necessary templates and/or physical hardware to all trades requiring them in order that they may cut, reinforce or otherwise prepare their material or product to receive the hardware item. If physical hardware is required by any manufacturer, the hardware supplier shall ship to them such hardware via prepaid freight in sufficient time to prevent any delay in the execution of their work.
E. Keying Schedule:
    1. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
    2. Use ANSI/BHMA A156.28 “Recommended Practices for Keying Systems” as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    3. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    4. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    5. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
        a. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
    6. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.
F. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
    1. Wiring Diagrams: For power, signal, and control wiring and including:
        a. Details of interface of electrified door hardware and building safety and security systems.
        b. Schematic diagram of systems that interface with electrified door hardware.
        c. Point-to-point wiring.
        d. Risers.
G. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory or shop prepared for door hardware installation.

1.05 INFORMATIONAL SUBMITTALS:

A. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
B. Product data for electrified door hardware:
   1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
C. Certificates of Compliance:
   1. UL listings for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
   2. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in “QUALITY ASSURANCE” article, herein.
   3. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in “QUALITY ASSURANCE” article, herein.
D. Warranty: Special warranty specified in this Section.

1.06 CLOSEOUT SUBMITTALS

A. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
   1. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
   2. Catalog pages for each product.
   3. Factory order acknowledgement numbers (for warranty and service)
   4. Name, address, and phone number of local representative for each manufacturer.
   5. Parts list for each product.
   6. Final approved hardware schedule, edited to reflect conditions as-installed.
   7. Final keying schedule
   8. Copies of floor plans with keying nomenclature
   9. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
   10. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.07 QUALITY ASSURANCE

A. All hardware items shall comply with ANSI Specifications, State of Texas Program for the Elimination of Architectural Barriers, the Texas Accessibility Standards (TAS), and the Americans with Disabilities Act (ADAAG).
B. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
D. Windstorm Assembly Installer Qualifications: Installers are to be factory trained for shop and field installation prior to project bid, and are responsible for commissioning, servicing, and warranting the installed equipment specified for the project. A pre-installation site inspection of the frame and floor conditions shall be conducted by the factory trained installer prior to any Windstorm assembly hardware applied to the opening.
E. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributor with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during

the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

1. This consultant shall have experience in the preparation of architectural hardware specifications, estimating, detailing, ordering, servicing of architectural hardware in all its branches and will be available at reasonable times during the course of the work for project hardware consultation to the Owner, Architect and Contractor
2. It is the hardware distributor's responsibility to coordinate the hardware specified to work with the Aluminum doors.

F. Severe Storm Shelter Openings: Provide complete door systems for hurricane or tornado resistant storm shelters and other areas of refuge complying and tested according to FEMA P-361 (2015), Design and Construction Guidance for Community Safe Rooms; and ICC 500 (2014), ICC/NSSA Standard for the Design and Construction of Storm Shelters.

G. All exterior locksets, latchsets and deadbolts shall be mortise style conforming to ANSI 156.13, Series 1000, Grade 2.

H. All interior locksets and latchsets and deadbolts shall be mortise style conforming to ANSI 156.2 Series 4000, Grade 1.

I. All doors required to be rated shall be installed with UL rated hardware UL label.

J. Hardware has been specified herein by manufacturer's name, brand and catalog numbers for the purpose of establishing a basis for quality, finish, design and operational function. To insure a uniform basis of acceptable material, it is the intention that only manufacturer's items specified as "Acceptable and Approved" be furnished for use on this project. Obtain each type of hardware (latch and lock sets, hinges, exit devices closers) from single manufacturer, although several may be indicated as offering products complying with requirements.

1. Substitutions: Request for substitutions of items of hardware shall be made to the Architect no later than thirty (30) after notice to proceed. Request for substitutions shall be accompanied by samples and/or detailed information as to the manufacturer of the product. Substitutions require approval of Architect and City of Richardson facilities department.

K. Accessibility Standards: Hardware shall be in conformance with Article 9102, Texas Civil Statutes, Elimination of Architectural Barriers Act of Texas.

1. Door Closers: The sweep period of closers shall be adjusted so that from an open position of 90 degrees, the door will take at least five seconds to move to an open position of approximately 12 degrees.
2. The maximum force for pushing or pulling open door shall be as follows:
    a. Sliding, folding, and interior hinged doors and gates: Not to exceed 5 lbf.
    b. Exterior hinged doors: Not to exceed 8.5 lbf.
    c. Fire doors: Adjusted to meet minimum closing force permitted by governing fire safety standards.
3. Federal Accessibility Standards: Hardware shall be in accordance with all requirements of the Americans With Disabilities Act (most current version).

L. Pre-Submittal Conference: Contractor shall schedule and hold a pre-submittal conference in compliance with requirements in Division 01 Project Meetings requirements, with attendance by the architect, the owner's representative(s), the contractor, representatives of Supplier(s), Installer(s), to review proper methods and the procedures for receiving, handling, and installing door hardware. Meeting to be conducted and documented by the hardware supplier. Items to be discussed include the following:

1. Submittal preparation, format and coordination.
2. Proper installation of all items of hardware to be incorporated into the Project.
3. Discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
4. Review sequence of operation narratives for each unique access controlled opening.
5. Review and finalize construction schedule and verify availability of materials.
6. Review the required inspecting, testing, commissioning, and demonstration procedures
7. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware

(including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.

M. Keying Coordination Meeting: Contractor shall schedule and conduct a keying coordination meeting with Owner, and Owner's access control separate contract representative, to confirm final cores, keying, and door hardware coordination with the access control system. Conduct meeting with adequate time to coordinate any revisions including associated lead time, as required to avoid delays to construction schedule or substantial completion.
   1. Keying conference to incorporate the following criteria into the final keying schedule document:
      a. Function of building, purpose of each area and degree of security required.
      b. Plans for existing and future key system expansion.
      c. Requirements for key control storage and software.
      d. Installation of permanent keys, cylinder cores and software.
      e. Address and requirements for delivery of keys.
   2. Conduct conference at [**Project site**] <**Insert location**>.
   3. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
      a. Flow of traffic and degree of security required.
      b. Preliminary key system schematic diagram.
      c. Requirements for key control system.
      d. Requirements for access control.
      e. Address for delivery of keys.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. All items of hardware to be delivered to the job site shall be completely packaged in manufacturer's unbroken containers, bearing on the outside, name, model number and mark identifying each container's installation location. Materials stored in dry storage space with no moisture or condensation present.
   1. All items of hardware to be delivered to the jobsite shall be completely packaged with all necessary screws, bolts, miscellaneous parts, instructions and where necessary installation templates for manufacturer's suggested installation. They are to be clearly labeled as to conveniently identify them and their intended location in the building.

B. Door Hardware shall be delivered to the Contractor by the hardware supplier. Direct factory shipments to the jobsite are not acceptable.
   1. A representative of the Contractor shall receive the hardware when delivered at the jobsite. A dry locked storage space complete with shelving, shall be set aside for the purpose of unpacking, sorting out, checking and storage.
   2. The hardware shall be jointly inventoried by representatives of the Contractor and the Hardware Supplier.
   3. Items damaged in shipment shall be replaced promptly and with proper material without additional cost to the Contractor or Owner.

C. All hardware shall be handled in a manner to minimize marring, scratching or damage.

D. Store and handle all materials strictly according to the manufacturer’s instructions.

1.09 COORDINATION, SEQUENCING AND SCHEDULING

A. Any part of the finish hardware required by the frame or door manufacturers or other suppliers that is needed in order to produce doors or frames is to be sent to those suppliers in a timely manner, so as not to interrupt job progress.

B. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

C. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required

connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems. Make all necessary coordination with access control installer prior to preparing shop drawings and prior to time when preparation for frames and electronic hardware needs to be made in wall and door construction.

D. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications
E. Schedule and conduct a keying coordination meeting with Owner's representative to confirm final keying. Schedule meeting with adequate time to coordinate final decisions and to have final cores and keys in time to avoid delays to substantial completion or owner occupancy.
F. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.10 PROJECT CONDITIONS

A. Coordination: Contractor responsible for coordination of information between hardware and manufacturers and other trades as required. Contractor shall advise each party of any changes during course of construction, including but not necessarily limited to the following:
   1. Door and frame manufacturers.
   2. For compatibility of thresholds provided under this Section with adjacent flooring conditions and transitions, as required for flooring transitions compliant with Texas Accessibility Standards (TAS).
   3. Floor and wall stops compatible with floor plan and construction type and finishes to which they attach. (In general, use wall stops where possible).
   4. Owner's separate contracts for access control / security, and door bell and intercom systems, for compatibility and acceptance of hardware, prior to ordering.
   5. Coordination of door hardware installation with glazing and louvers in doors as required to avoid installation, code, and handicap accessibility conflicts.
   6. All coordination related to door handing.
   7. Installation conditions for closers with adjacent construction and possible obstructions, and to allow for widest possible opening arc to allow to swing back to wall unless specifically indicated otherwise.
   8. Frame sizes coordinated with partition types indicated and required frame anchorages.
   9. Materials not properly coordinated replaced by Contractor at his expense.

1.11 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of the hardware.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Electrical component defects and failures within the systems operation.
C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
D. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Beginning from date of Substantial Completion, for durations indicated.
   a. Closers:
      1) Mechanical: 30 years
   b. Locksets:
      1) Mechanical: 3 years
      2) Electrified: 1 year

1.12 WARRANTY DOES NOT COVER DAMAGE OR FAULTY OPERATION DUE TO IMPROPER INSTALLATION, IMPROPER USE OR ABUSE.

1.13 MAINTENANCE MATERIALS

A. At the completion of the project, supply to the Owner the following items:
   1. Instruction sheets of each item furnished for inclusion in O&M manuals.
   2. Two (2) sets of each of any specialized or non-standard tool for installation of each non-standard item furnished.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approval of manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Acceptable Manufacturers” in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
B. Approval of products from manufacturers indicated in “Acceptable Manufacturers” is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.
C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fasteners
   1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
   2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
   3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
   4. Install hardware with fasteners provided by hardware manufacturer.
   5. Design of all fastenings shall harmonize with the hardware as to material and finish.
B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.
   1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
   2. Use materials which match materials of adjacent modified areas.
   3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.
C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
   1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
D. Cable and Connectors: Hardwired Electronic Access Control Lockset and Exit Device Trim:

1. Data: 24AWG, 4 conductor shielded, Belden 9843, 9841 or comparable.
2. DC Power: 18 AWG, 2 conductor, Belden 8760 or comparable.
3. Provide type of data and DC power cabling required by access control device manufacturer for this installation.
4. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with sufficient number and wire gauge with standardized Molex plug connectors to accommodate electric function of specified hardware. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 FINISH OF HARDWARE

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
B. Finish of items shall be as specified under the door hardware sets of this section.
C. The finish of items not specially mentioned above nor set forth in the schedule shall be US26D, unless shown otherwise.
D. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
E. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.04 HINGES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product: Ives 5BB series.
B. Requirements:
   1. Provide hinges conforming to ANSI/BHMA A156.1.
   2. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
   3. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
   4. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
      a. Steel Hinges: Steel pins
      b. Non-Ferrous Hinges: Stainless steel pins
      c. Out-Swinging Exterior Doors: Non-removable pins
      d. Out-Swinging Interior Lockable Doors: Non-removable pins
      e. Interior Non-lockable Doors: Non-rising pins
   5. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
   6. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
   7. Provide mortar guard for each electrified hinge specified.
   8. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.

2.05 CONTINUOUS HINGES

A. Aluminum Geared

1. Manufacturers:
    a. Scheduled Manufacturer: Ives.
2. Requirements:
    a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
    b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
    c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
    d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
    e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
    f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
    g. Install hinges with fasteners supplied by manufacturer.
    h. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.06 ELECTRIC POWER TRANSFER

A. Manufacturers:
    1. Scheduled Manufacturer: Von Duprin.
B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.
C. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.07 FLUSH BOLTS

A. Manufacturers:
    1. Scheduled Manufacturer: Ives.
B. Requirements:
    1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.08 MORTISE LOCKS

A. Manufacturers and Products:
    1. Scheduled Manufacturer and Product: Schlage L9000 series
B. Requirements:
    1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3 hour fire doors.
    2. Indicators: Where specified, provide indicator window measuring a minimum 2 inch x 1/2 inch with 180 degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
        a. Outside Occupancy Indicator: Provide indicator above cylinder or emergency release for visibility while operating the lock that identifies an occupied/unoccupied status of the lock or latch.

3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to “KEYING” article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
8. Provide motor based electrified locksets with electrified options as scheduled in the hardware sets and comply with the following requirements:
    a. Universal input voltage – single chassis accepts 12 or 24V DC to allow for changes in the field without changing lock chassis.
    b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case
    c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
    d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
    e. Request to Exit Switch (RX) –
        1) Modular Design – provide electrified locks capable of using, adding, or changing a modular RX switch without opening the lock case.
        2) Monitoring – where scheduled, provide a request to exit (RX) switch that detects rotation of the inside lever.
    f. Connections – provide quick-connect Molex system standard.
9. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
    a. Lever Design: Schlage 17A

2.09 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:
    1. Scheduled Manufacturer and Product: Schlage ND series.
B. Requirements:
    1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3 hour fire doors.
    2. Cylinders: Refer to “KEYING” article, herein.
    3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
    4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
    5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
    6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
    7. Provide electrified options as scheduled in the hardware sets.
    8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
        a. Lever Design: Schlage Sparta

2.10 EXIT DEVICES

A. Manufacturers and Products:
    1. Scheduled Manufacturer and Product: Von Duprin 99/33A series.
B. Requirements:
    1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.

2. Cylinders: Refer to “KEYING” article, herein.
3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide flush end caps for exit devices.
7. Provide exit devices with manufacturer’s approved strikes.
8. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
10. Provide cylindrical or hex-key dogging as specified at non fire-rated openings.
11. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
12. Devices shall be furnished with outside trim lever handles matching locksets.

2.11 CYLINDERS

A. Manufacturers and Products:
   1. Scheduled Manufacturer: Schlage SFIC
B. Requirements:
   1. Provide cylinders/cores, from the same manufacturer of locksets, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer’s series as indicated. Refer to “KEYING” article, herein.
   2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
   3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent-protected until the year 2029.
   4. Nickel silver bottom pins.
C. Construction Keying:
   1. Replaceable Construction Cores.
      a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
         1) 3 construction control keys
         2) 12 construction change (day) keys.

2.12 KEYING

A. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
B. Requirements:
   1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
      a. Master Keying system as directed by the Owner.
   2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
   3. Provide keys with the following features:
      a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
      b. Patent Protection: Keys and blanks protected by one or more utility patent(s) until the year 2029.
   4. Identification:
      a. Identification stamping provisions must be approved by the Architect and Owner.

b. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
c. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
d. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

5. Quantity: Furnish in the following quantities.
   a. Change (Day) Keys: 3 per cylinder/core.
   b. Permanent Control Keys: 3.
   c. Master Keys: 6.

2.13 KEY CONTROL SYSTEM

A. Manufacturers:
   1. Scheduled Manufacturer: Telkee.
   2. Acceptable Manufacturers: HPC, Lund.
B. Requirements:
   1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
      a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
      b. Provide hinged-panel type cabinet for wall mounting.

2.14 KEY MANAGEMENT SOFTWARE

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product: Schlage SITEMASTER 200.
B. Requirements:
   1. Software: Provide tracking, issuing, collecting and transferring information regarding keys. Provide customized query, reporting, searching capability, comprehensive location hardware listings, display key holder photos and signature for verification, and provide automatic reminders for maintenance, back-ups and overdue keys.
   2. Provide training for Owner's personnel on proper operation and application of key management software.

2.15 DOOR CLOSERS

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product: LCN 4040XP series.
B. Requirements:
   1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
   2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
   3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 3/4 inch (19 mm) diameter double heat-treated pinion journal.
   4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
   5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
   6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.

7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.16 DOOR TRIM

A. Manufacturers:
   1. Scheduled Manufacturer: Ives.
B. Requirements:
   1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
   2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
   3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
   4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
   5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
   6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
   7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
   8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.17 PROTECTION PLATES

A. Manufacturers:
   1. Scheduled Manufacturer: Ives.
B. Requirements:
   1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
   2. Sizes of plates:
      a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
      b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
      c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.18 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturers: Glynn-Johnson.
B. Requirements:
   1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
   2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.

3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.19 DOOR STOPS AND HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives.
B. Provide door stops at each door leaf:
   1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
   2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
   3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.20 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:
   1. Scheduled Manufacturer: Zero International.
B. Requirements:
   1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
   2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
   3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.21 SILENCERS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives.
B. Requirements:
   1. Provide "push-in" type silencers for hollow metal or wood frames.
   2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
   3. Omit where gasketing is specified.

2.22 DOOR POSITION SWITCHES

A. Manufacturers:
   1. Scheduled Manufacturer: Schlage.
B. Requirements:
   1. Provide recessed or surface mounted type door position switches as specified.
   2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.23 FINISHES

A. Finish: BHMA 626/652 (US26D); except:
   1. Hinges at Exterior Doors: BHMA 630 (US32D)

2. Continuous Hinges: BHMA 630 (US32D)
3. Continuous Hinges: BHMA 628 (US28)
4. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
5. Protection Plates: BHMA 630 (US32D)
6. Overhead Stops and Holders: BHMA 630 (US32D)
7. Door Closers: Powder Coat to Match
8. Wall Stops: BHMA 630 (US32D)
9. Latch Protectors: BHMA 630 (US32D)
10. Weatherstripping: Clear Anodized Aluminum
11. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Where on-site modification of doors and frames is required:
   1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
   2. Field modify and prepare existing door and frame for new hardware being installed.
   3. When modifications are exposed to view, use concealed fasteners, when possible.
   4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
      a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
      b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
      c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
   2. Custom Steel Doors and Frames: HMMA 831.
   3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
B. Install each hardware item in compliance with manufacturer’s instructions and recommendations, using only fasteners provided by manufacturer.
C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
H. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches (750 mm) of door height greater than 90 inches (2286 mm).
I. Lock Cylinders: Install construction cores to secure building and areas during construction period.
    1. Replace construction cores with permanent cores as indicated in keying section.
J. Wiring: Coordinate with Division 26, ELECTRICAL sections for:
    1. Conduit, junction boxes and wire pulls.
    2. Connections to and from power supplies to electrified hardware.
    3. Connections to fire/smoke alarm system and smoke evacuation system.
    4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
    5. Testing and labeling wires with Architect's opening number.
K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
L. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
M. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
S. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 FIELD QUALITY CONTROL

A. Engage qualified manufacturer trained representative to perform inspections and to prepare inspection reports.
    1. Representative will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.05 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
    1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.06 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.
B. Clean operating items as necessary to restore proper function and finish.
C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.07 DOOR HARDWARE SCHEDULE

A. Hardware items are referenced in the following hardware. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.

3.08 HARDWARE SETS

END OF SECTION 08 71 00

SECTION 08-8000 – GLAZING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:

1. Provide all glass and glazing as shown on the drawings and as herein specified.

B. Related Sections include the following:

1. Division 1 Section “Mockups”
2. Division 5 Section “Metal Fabrications.”
3. Division 8, All “Door” and “Window” Sections.
4. Division 8 Section “Aluminum Entrances and Storefront.”
5. Division 8 Section “Metal Windows”.
6. Division 8 Section "Mirrors."
7. Division 8 Section "Fire-Rated Glazing."

1.03 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
C. Interspace: Space between lites of any insulating glass unit that contains dehydrated air or a specified gas.
D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer’s written instructions. Defects include peeling, cracking and other indications of deterioration in metallic coating.
E. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer’s written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer’s written instructions.

Defects include edge separation, delamination material obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standards.

1.04 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 01 Section - Project Management and Coordination.
   1. Attendees: General Contractor/Construction Manager, Architect, Owner's representative, Glazing installer, storefront and curtain wall supplier/installer.
   2. Review submittal progress, approved submittals and compliance with energy requirements.
   3. Review methods and procedures related to glazing installation, including manufacturer's written instructions.
   4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   5. Review temporary protection requirements for glazing during and after installation.

B. General Contractor to record minutes and issue for review within 7 days for review and modifications by all attendees.

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. For sealants, indicating VOC content.

B. Shop Drawings:
   1. Review curtain wall and window shop drawings and submit acceptance of details as suitable for proposed glass products.

C. Submit 12-inch square samples of each type of glass indicated except for clear monolithic glass products, and 12-inch long samples of each color required (except black) for each type of sealant or gasket exposed to view.

D. Glazing Accessory Samples: For sealants, in 12-inch lengths.

E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

F. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.06 INFORMATIONAL SUBMITTALS:

A. Qualification Data. For Installer.

B. Product Certificates: Certificate of Compliance for all glass product other than clear monolithic vision glass 12 inches square all glass products.
   1. Insulating Glass Certification: Submit data verifying compliance with IGCC, Class A level.

C. Compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants and other glazing materials.
   1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Wind Pressure and Thermal Stress Analysis: Submit thermal stress analysis of glass where thermal stress may occur.

E. Sample Warranties: For special warranties.

1.07 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
    a. Glass fabricator to have 10 years of experience and meet ANSI / ASQC Q9002 1994.
2. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certified Glass Installer Program.
3. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

B. Coordination: Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the inspecting and testing agency, Insulating Glass Certification Council.

D. Energy Code Compliance: Coordinate all exterior glazing with applicable framing systems to assure compliance with current applicable energy codes before product submittals. If revisions to specified products are required coordinate revised products with the architect and owner.

E. Installation Criteria: FGJA "Glazing Manual", in addition to any other referenced standards.

F. Single Source fabrication responsibility: Fabrication processes, including Low E and reflective coatings, insulating, laminating, silkscreen, and tempering, shall be fabricated by a single Fabricator.

G. Free Standing Mockups: In addition to samples required in Submittals paragraph, supply product and installation in the construction of mockups as specified and as detailed on the drawings. Build mockups using materials indicated for the completed work as detailed on the drawings to verify selections made under Submittals, to demonstrate typical construction and waterproofing details, and to demonstrate aesthetic effects and set quality standards for materials and installation. Modify mock-up requirements below as applicable to project requirements.
    1. Prior to product installation a field-constructed mock-up shall be provided under the provisions of Division 1 Section - Submittals, Product Data, Samples and Mock-ups, to verify details & tie-ins, and to demonstrate the required quality of materials and installation.
    2. Construct a typical exterior wall section, incorporating back-up wall, cladding, window and sill, insulation, flashing and any other critical junctions (roof, foundation, etc.) as detailed in Drawings at typical wall locations as located by Architect.
    3. Locate mockups as directed by Architect.
    4. Build mockups as indicated in Drawings.
        a. Show typical components, attachments to building structure, and methods of installation.
    5. Obtain Architect's approval of mockups before starting installation.
    6. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
    7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
    8. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
    9. Demolish and remove mockups when directed.

H. Construction Samples:

1. Install glazing systems sample panels on the building as specified in Section 08 41 13 "Aluminum-Framed Entrances and Storefronts" and Section 08 51 13 "Metal Windows" to match glazing systems required for Project, including glazing methods [as approved on field mock-up panels**]** for review and approval.
2. Subject to compliance with requirements, approved sample panels may become part of the completed Work if undisturbed at time of Substantial Completion.

1.08 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
   2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
   4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
   5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.09 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect glazing materials according to manufacturer’s written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun or other causes.
B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by the glazing material manufacturers and when glazing channel substrates are wet from rain, frost condensation, or other causes.
   1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
   1. Warranty Period: 10 years from date of Substantial Completion.
B. Warranty for Insulating Units: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.
   1. Warranty Period: 10 years from date of Substantial Completion.

2. Reflective glass whose reflective coating cracks, peels or discolors shall be replaced at no charge (material only) for minimum ten (10) year period beginning on date of Substantial Completion.

C. Manufacturer's Special Warranty for Heat-Soaked Tempered Glass: Manufacturer agrees to replace heat-soaked tempered glass units that spontaneously break due to nickel sulfide (NiS) inclusions at a rate exceeding 0.3 percent (3/1000) within specified warranty period. Coverage for any other cause is excluded.
   1. Warranty Period: Five years from date of Substantial Completion.

D. Plate Mirrors: Provide a written 5-year warranty against de-silvering and other visual defects, from the date of Substantial Completion.
   1. Warranty covers deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer's published instructions.

E. Glazing installer shall coordinate glass and glazing installation with framing systems, and install glass and glazing in accordance with manufacturer's instructions, so that guarantee is maintained.

PART 2 - PRODUCTS

2.01 DESIGN REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazing.

C. Glass Design: Provide glass lites in the thickness and strengths (annealed or heat-treated) to meet or exceed the following criteria based on analysis of Project loads and in-service conditions. Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses complying with ASTM E1300 and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
   1. Specified Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.4.2, "Analytic Procedure," based on mean roof heights above grade indicated on Drawings.
   2. Minimum glass thickness of lites composed of annealed or heat-treated glass are selected so the worst-case probability of failure does not exceed the following:
      a. Eight (8) lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action.
      b. One (1) lite per 1000 for lites set over 15 degrees off vertical and under action of wind or snow.
      c. Specified Design Wind Loads: As indicated on the Structural Drawings
      d. Specified Design Snow Loads: As indicated on the Structural Drawings, but not less than snow loads applicable to Project, required by ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 7, "Snow Loads.
      e. Minimum Glass Thickness for Exterior Lites: Not less than 6mm
      f. Thickness of Tinted and Heat-Absorbing glass: Provide the same thickness of each tint color indicated throughout Project.
   3. Maximum Lateral Deflection: For the following types of glass supported on all four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.

a. For monolithic-glass lites heat treated to resist wind loads.
b. For insulating glass.
c. For laminated-glass lites.

D. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F , ambient; 180 deg F, material surfaces.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 1/4" thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg .
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBNL WINDOW 6 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
7. Solar Optical Properties: NFRC 300.

F. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II, or Category IV Risk Factor as indicated in glass schedule.
1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

G. Insulating glass products are to be permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
1. Insulating Glass Certification Council (IGCC).

2.02 GLASS PRODUCTS, GENERAL

A. Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section or in referenced standards.
1. GANA (Glass Association of North America) Publications
a. GANA Glazing Manual
b. Laminated Glazing Reference Manual
c. Tempering Division - Engineering Standards Manual
2. AAMA (American Architectural Manufacturers Association) Publications: AAMA GDSG-1, “Glass Design for Sloped Glazing,” and AAMA TIR A7, “Sloped Glazing Guidelines.”
3. IGMA (Insulating Glass Manufacturers Association) Publication for Sloped Glazing: IGMA TB-3001, “Guidelines for Sloped Glazing.”
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, “North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use.”
5. Consumer Product Safety Standard 16 CFR 1201, Category II
6. LSGA (Laminators Safety Glass Association Inc.) Publications.
7. Federal Spec. MIL-P-46144, Polycarbonate Sheet

B. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
1. Minimum Glass Thickness for Exterior Lites: 1/4".

2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with “Performance Requirements” Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with “Performance Requirements” Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.03 MANUFACTURERS

A. Basis of Design Products: Basis of Design products are indicated in the Glass Schedule later in this section. Provide Basis of Design products, or equal products as approved by Architect.

B. Manufacturers: Subject to compliance with Requirements, Manufacturers offering products acceptable for use on this project include the following:
   1. AGC Glass North America.
   2. Guardian Glass.
   3. NSG Pilkington North America.
   4. Saint-Gobain.
   5. Vitro Architectural Glass (Formerly PPG Ideascapes).

C. Fabricators for Insulating Glass Units:
   1. Basis of Design Fabricator: Guardian Glass

D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.04 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Ultraclear Float Glass (if / where indicated): ASTM C 1036, Type I, Class I (clear), Quality-Q3; and with visible light transmission of not less than 91 percent.

C. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.

D. Heat-strengthened float glass: ASTM C 1048, Kind HS (heat-strengthened glass), Type I, Quality-Q3.
   1. Class 1 (clear) or Class 2 (tinted) as indicated.
   2. Condition A (uncoated), unless otherwise indicated.
   3. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

E. Fully tempered float glass: ASTM C 1048. Kind fully tempered (FT), Quality-Q3.
   1. Class 1 (clear) or Class 2 (tinted) as indicated.
   2. Condition A (uncoated), unless otherwise indicated.

F. Reflective- and Low-E-Coated Vision Glass: ASTM C1376.

G. Glass Mirrors: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
   1. Clear Glass: Mirror Select Quality.

2.05 INSULATED GLASS

A. Insulating-Glass Units (IGU): Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
   1. ASTM E773 Seal Durability of Sealed Insulating Glass Units
   2. ASTM E774 Sealed Insulating Glass Units
   3. Sealed insulating glass units to be double sealed with a primary seal of black (or gray) polyisobutylene and a secondary seal of black (or gray) silicone.

4. Lites shall be separated by an **aluminum** spacer with 3 bent corners and 1 keyed-soldered corner, or 4 bent corners and a straight butyl injected zinc plated steel straight key joint, to provide a hermetically sealed and dehydrated air space.
    a. Aluminum Spacer Finish: Powder Coated Aluminum, in color as selected by Architect.
5. Units shall be certified for compliance with seal classification "CBA" by the Insulating Glass Certification Council (IGCC) and tested in accordance with the above ASTM Test Methods.
6. Tinted glass units heat strengthened as recommended by manufacturer to protect against breakage due to thermal stress.

2.06 MISCELLANEOUS GLAZING MATERIALS

A. General: Select glazing sealants, tapes, gaskets and other glazing materials of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
E. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.07 GLAZING SEALANTS

A. Cleaners, Primers, and Sealers, General: Types shall be as recommended by sealant or gasket manufacturer, and as specified in other Sections.
    1. Structural Glazing Sealants: ASTM C1184, and as recommended by glazing system Manufacturer.
    2. In event of conflicts, the most restrictive requirements acceptable to glazing system Manufacturers shall prevail.
B. Sealant: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
    1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
    2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.
C. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
    1. Compatibility Testing: Prior to application of sealants, test gaskets, spacers, setting blocks, and other glazing accessories being provided for project to determine compatibility with structural silicone sealants.
        a. Submit representative samples of accessories to manufacturer for factory testing.
        b. Perform testing in accordance with ASTM C1087.
        c. Incompatible accessories shall be replaced with ones recommended by and tested by manufacturer as acceptable.
D. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT; SWRI validation.

1. Basis of Design Product: Dow Corning Corporation, 795 Silicone Building Sealant.
2. Application: Typical glazing application, unless otherwise indicated.

2.08 MISCELLANEOUS MIRROR MOUNTING MATERIALS

A. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
   1. Adhesive shall have a VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
B. Mounting Accessories: Brushed stainless steel (Type 302) mirror clips similar to KV277 at bottom and KV278 at top in number as required to accommodate size of mirror.

2.09 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
   1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   2. Temperature Change: 180 deg F, material surfaces.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Carefully inspect and verify all job site conditions and measurements. Field verify all existing conditions and dimensions which receive glazing.
B. Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.
   1. Verify prepared openings for glazing are correctly sized and within tolerance.
   2. Verify that a functioning weep system is present.
   3. Verify that the minimum required face and edge clearances are being followed.
   4. Verify effective sealing between joints of glass-framing members.
   5. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.
   6. Verify glazing channels are free of burrs, irregularities, and debris.
   7. Verify glass is free of edge damage or face imperfections.
   8. Inspect door and frames to determine that frames, sash, and stops are set true and straight. Sash rabbets and stops shall be clean and dry at time of glazing.
C. Do not proceed until unsatisfactory conditions have been corrected. Beginning installation constitutes acceptance of substrate / conditions.

3.02 PREPARATION

A. Provide glass manufacturer's recommended edge clearances when sizing glass.
B. Remove protective coatings from surfaces to be glazed.
C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrates indicated under the project conditions.
   1. Clean glazing channels and other framing members receiving glass immediately before glazing.
   2. Remove coatings not firmly bonded to substrates.
   3. Clean glass and glazing surfaces to remove dust, oil, and contaminants, and wipe dry.

D. Verify measurements of sash and openings at Project.
   1. Dimensions shown or indicated are given only as a guide for estimating purposes, and actual size shall be determined by measurement of the actual openings. Accurately cut glass to fit openings with proper clearances and setting block height.
E. Coordinate with and check Shop Drawings furnished by other suppliers of Work affecting this Section to avoid field installation problems.
F. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.
G. Before glazing metal sash, remove oil, lacquer, or other material to which the compound will not readily adhere or which will tend to delaminate from metal and cause a leak through the glazing seal.

3.03 GLAZING

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in "GANA Glazing Manual" and in other referenced glazing publications.
B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance,
C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
E. Glazing to fit line in rabbet with all edges straight and true. Size substantially as shown on the drawings, however Contractor shall fill sash and openings as actually constructed whether more or less than sizes given.
F. Material installed in a full bed of sealant, tooling finished surfaces smooth.
G. Mirrors installed using mirror glazing angles, concealed clips and mirror setting mastic. Mastic applied on substrate in spot application, spacing and sizes as recommended by mirror manufacturer for use intended.

3.04 GLAZING INSTALLATION

A. General:
   1. Comply with glass fabricator’s recommendations.
   2. Install in accordance with glass and frame manufacturer's instructions.
   3. Install plumb, level, square, true to line, and without warp or rack Provide all fasteners required for installation.
   4. Except where curtain wall, window, entrance or glass manufacturer recommends otherwise, comply with Flat Glass Marketing Association (FGMA) Sealant Manual and FGMA Glazing Manual.
   5. Material installed in a full bed of sealant, tooling finished surfaces smooth.
   6. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
   7. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
   8. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
B. Glazing to fit line in rabbet with all edges straight and true. Size substantially as shown on the drawings, however Contractor shall fill sash and openings as actually constructed whether more or less than sizes given.
C. Do not apply glazing materials at temperatures below manufacturer's recommendations or to damp or frosted surfaces. Apply glazing material according to the manufacturer's instructions using proper primers as required.

D. Set glass using neoprene setting blocks and spacers to insure proper edge clearance and uniform beads of compound. Clearances shall conform to FGMA Glazing Manual requirements. Center glass in glazing rabbets.
   1. Butt glazing requirements: Apply mildew resistant silicone sealant to flush depth of joint as indicated by sealant manufacturer.
E. Provide spacers for glass lites where length plus width is larger than 50 inches.
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch- minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
F. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
G. Check openings to confirm proper clearance at perimeters and between glass and stops.
   1. Clean surfaces of rabbet (including stops) and surface of glass which will come into contact with sealant. Use solvents and methods which insure clean, dry surfaces without film or foreign material when sealant is placed.
H. Remove and replace glazing beads carefully to avoid marking or defacing any portion of frame, sash, or fastenings.
   1. Set glass in full bed of glazing tape or sealant. Clean glazing material after stops are installed. Clean excess compound, etc. from glass after setting in conformance with glass manufacturer's recommendations.
   2. If recommended prime surfaces prior to glazing.
I. Set glass with reams (waves) running horizontally. Set glass with factory attached labels in place.
J. Setting Blocks: Place setting blocks at locations recommended by glass manufacturer, generally between 1/4 points and 6 inches from corner, except at glazed doors.
   1. At glazed doors, provide one block at sill, located 3 inches up from edge of glass at hinge side; one block at hinge side jamb, located 3 inches up from lower edge of glass; one block at head, located 3 inches from edge of glass at latch side of door; and, one block at jamb at lock side of door, located 3 inches down from edge of glass at top corner.
   2. Use blocks of length required to properly support glass. Offset approximately 1 inch from shims.
K. Glass Installation in Steel (Hollow Metal) Frames:
   1. Glaze frames using pre-shimmed tape on both sides. Firmly glaze in place with joints sealed, free of rattles.
   2. Set glass on setting blocks with a full bed of sealant or glazing tape.
L. Glass Installation in Aluminum Frames:
   1. Glaze aluminum frames using preformed EPDM elastomeric glazing extrusion separately or in combination with sealant and pre-shimmed glazing tape in compliance with aluminum frame supplier's recommendations.
   2. Set glass on setting blocks as recommended by manufacturer.
   3. Apply tape and/or sealant to produce uniform sight line even with frame.
   4. Set glass in gaskets with corners sealed.
M. Glazing Sealant: Along entire bottom edge of light, and up at least 6 inches at each jamb, gun in continuous full bed of sealant to fill voids.
   1. Fill entire space, full width of pane, full depth of glass, with sufficient sealant to form heel along inside face and edge of glass.
   2. At other edges (top and sides) gun in continuous heel bead of sealant along edges of glass perimeter to set stop against and into, acting as fill between glass and stop.
   3. Immediately after setting glass, at entire perimeter of glass, gun in sealant between stop and glass so space above spacer is completely filled, without voids.

4. Place sealant flush with daylight edge of stops, with slight watershed at exterior. Provide straight, smooth surface meeting at opening corners with sharp intersection.
5. Leave no sealant on exposed surfaces of stops and glass.

3.05 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
E. Do not remove release paper from tape until right before each glazing unit is installed.
F. Apply heel bead of elastomeric sealant.
G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.06 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.07 MIRRORS INSTALLATION

A. Mirrors installed using mirror glazing angles, concealed clips and mirror setting mastic. Mastic applied on substrate in spot application, spacing and sizes as recommended by mirror manufacturer for use intended.
    1. General Contractor shall coordinate with electrician to provide mirrored plates for outlets and switches installed in areas of mirror wall at fitness room.

3.08 FIELD QUALITY CONTROL

A. Engage Manufacturer's representative to verify that installation of Ballistic and Storm-Impact-Resistant glazing is in conformance to the manufacturer's recommendations. Refer to requirements in related Sections.
B. Correct deficiencies in or remove and replace components that inspections and test reports indicate do not comply with specified requirements.
C. Water / Hose Testing: Refer to Division 01 requirements.
    1. In event of failed testing, additional testing will be performed, at Contractor's expense, to determine compliance of corrected Work with specified requirements.

3.09 ADJUSTING AND CLEANING

A. Immediately after installation remove nonpermanent labels and clean surfaces.
    1. Clean excess sealant or compound from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.

B. Glazing shall be protected from damage, and from contact with contaminating or harmful substances, during construction. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
   1. If, despite protection measures, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
   2. Contractor shall assume all responsibility for breakage and shall replace cracked, broken, scratched or otherwise defective glazing.

C. Glazing shall be carefully cleaned at time of final acceptance, removing all non-permanent labels, excess sealant, paint and other foreign substances. Wash glass as recommended in writing by glass manufacturer.

PART 4 - GLASS SCHEDULE

4.01 MONOLITHIC GLASS SCHEDULE.

A. **Type G1 -** Clear Glass **Type G1:** Annealed float glass per ASTM C 1036, Type I (transparent glass, flat), Class 1 (clear), Quality-Q3 (glazing select).

   1. Minimum Thickness: 1/4"

B. **Type G2** – Clear Glass**:** Fully tempered float glass per ASTM C 1036, Type I (transparent glass, flat), Class 1 (clear), Quality Q3 (glazing select), and heat-treated to comply with ASTM C 1048, Kind FT (fully tempered).

   1. Minimum Thickness: 1/4".
   2. Application: Where Safety glazing is required by code and as shown on the drawings.
   3. Safety glazing required.

C. **Type G3** - Fire Glass **Type G3:** 3/16” ceramic fire glazing, with up to 60 minute fire rating.

   1. Basis of Design Product: TGP Firelite.
   2. Positive Pressure Test: UL 10C; pass.
   3. Fire rating tested in accordance with ASTM E2010-01, UL 9 and UL 10B.
   4. STC Rating: 35 dB.
   5. Surface Finish: Standard

4.02 INSULATING GLASS SCHEDULE

A. **Type G4** - Low-E Coated Tinted Insulating Glass

   1. Basis-of-Design Product: Guardian Glass Sunguard SNX 62/27
   2. Overall Unit Thickness: 1 inch
   3. Minimum Thickness of Each Lite: : 1/4"

4. Outdoor Lite: Tinted float glass.
5. Tint Color: Gray
6. Interspace Content: Air.
7. Indoor Lite: Clear float glass.
8. Winter Nighttime U-Factor: 0.286
9. Summer Daytime U-Factor: 0.266
10. Visible Light Transmittance: 31 percent minimum.
11. SHGC: .18 maximum.
12. Safety glazing required.

B. **Type G5** - Low-E Coated Tinted Insulating Glass Fully Tempered - Type G5

1. Basis-of-Design Product: Guardian Glass Sunguard SNX 62/27
2. Overall Unit Thickness: 1 inch
3. Minimum Thickness of Each Lite: : 1/4"
4. Outdoor Lite: Tinted fully tempered glass.
5. Tint Color: Gray
6. Interspace Content: Air.
7. Indoor Lite: Clear fully tempered glass.
8. Winter Nighttime U-Factor: 0.286
9. Summer Daytime U-Factor: 0.266
10. Visible Light Transmittance: 31 percent minimum.
11. SHGC: .18 maximum.
12. Safety glazing required.

END OF SECTION 08 80 00

SECTION 08-9000 – LOUVERS & VENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Extent of louvers is indicated on drawing, including sizes and locations. Coordinate the size and locations with mechanical drawings and specifications. Provide complete attachments to substrates indicated.

B. Related Sections include the following:
   1. Division 04 Section - "Unit Masonry Assemblies".
   2. Division 05 Section - "Metal Fabrications", for masonry loose lintels and miscellaneous steel for louver attachment.
   3. Division 05 Section - "Cold Formed Metal Framing".
   4. Division 07 Section - "Air Barriers".
   5. Division 07 Section - "Joint Sealants".
   6. Division 07 Section - "Sheet Metal Flashing and Trim".
   7. Division 23 Mechanical, for ducts, dampers, and other adjacent construction.

1.03 QUALITY ASSURANCE

A. Performance Requirements: Where louvers are indicated to comply with specific performance requirements, provide units whose performance ratings have been determined in compliance with Air Movement and Control Association (AMCA) Standard 500.
B. Comply with SMACNA "Architectural Sheet Metal Manual" recommendation for fabrication, construction details and installation procedures, except as otherwise indicated.
C. Field Measurements: Verify size, location and placement of louver units prior to fabrication, wherever possible.
D. Coordination with Wall Openings: Verify final louver size includes required free area for model specified before creating rough opening in exterior material.
E. Shop Assembly: Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustments, splicing, mechanical joints and field assembly of units. pre-assemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordination.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for required products, including finishes.
B. Shop Drawings: Submit shop drawings for fabrication and erection of louver units and accessories. Include plans, elevations and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery and other information to determine compliance with specified requirements. Submit complete line of premium and standard color samples (12 colors minimum) for selection by Architect.

1.05 WARRANTY

A. Louver: Provide 5-Year Warranty on Louver.
B. Finnish: Provide 5-Year Warranty on Anodic finish. Provide 20-Year Warranty on PVDF coating.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Horizontal Blade Aluminum Louvers:
   1. Typical louver, unless noted otherwise: Stationary 6" deep frame, 37-1/2 degree blade angle and 5-15/16" vertical spacing, equal to Ruskin ELF6375DX, minimum 57% free area. Thickness not less than 0.081" for frames and extruded aluminum blades (Alloy 6063-T5). Provide bird screen and metal mesh insect screen.
   2. Louvers under 1 SF in size: Stationary 2" deep frame, 45 degree blade angle and 2-7/16" vertical spacing, equal to Ruskin ELF211D, nominal 38% free area. Thickness not less than 0.060" for frames and extruded aluminum blades (Alloy 6063-T5). Primer shall be thermo-cured, 0.2 mil d.f.t. Finish shall be factory applied, high performance, fluorocarbon coating. Provide bird screen and metal mesh insect screen.
   3. Size louvers to sizes noted in Drawings, or to required open areas noted in Mechanical drawings and specifications, whichever is greater.
   4. Sill Flashing: Provide integral sill flashing or matching extended sill pan flashing that provides a 1-1/2” to 2” vertical turn down with drip edge at the exterior wall finish.
   5. Aluminum Louver Finish:
      a. Prime coated for field painting, refer to Division 09, Section “Painting”.
B. Louver Screens: Provide frames consisting of U-shaped metal for permanently securing metal **insect screen and bird screen** mesh. Locate screens on inside face of louvers. Secure screens to louver frames with machine screws, spaced at each corner and at 12" o.c. between.
C. Foundation Vents: Galvanized, stationary nominal 4”deep by 8” high by 16” long, 45 degrees slope and overlapping blades. Vent construction with insect screen and water stop. Rear cover shall be closeable with wrench from the outside.
D. Cast Aluminum Foundation Vents: Stationary, cast aluminum, nominal 4” deep x 8” tall x 16” long, equal to Ruskin Model BVC100. Minimum 39% free area. Mill aluminum finish. Vent construction with insect screen and rear waterstop.
E. Fastenings: Fasteners for exterior applications may be hot-dip galvanized, stainless steel or aluminum.
F. Anchors and Inserts: Use non-ferrous metal or hot-dip galvanized anchors and inserts. Furnish inserts, as required, to be set into concrete or masonry work.

2.02 FABRICATION

A. Provide louvers and accessories of design, materials, sizes, depth, arrangement, and metal thicknesses indicated, or if not indicated, as required for optimum performance with respect to airflow; water penetration; air leakage, where applicable (for adjustable units, if any); strength; durability; and uniform appearance.
B. Fabricate frames including integral sills to suit adjacent construction with tolerances for installation including application of sealants in joints between louvers and adjoining work.
C. Include supports, anchorage, and accessories required for complete assembly.
D. Provide vertical mullions of type and at spacing recommended by manufacturer or 72" o.c., whichever is less. No intermediate.
E. Join Frame members to one another and to stationary louver blades by spline screwed, except where indicated otherwise or where field bolted connections between frame members are made necessary by size of louvers. Maintain equal blade spacing including separation between blades and frames at head and sill to produce uniform appearance.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation of anchorage which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.02 INSTALLATION

A. Locate and place louver units plumb, level and in proper alignment with adjacent work.
B. Use concealed anchorage wherever possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers, as indicated.
D. Repair finishes damaged by cutting, welding, soldering and grinding operations require for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items which cannot be refinished in field to shop, make required alterations, and refinish entire unit, or provide new units, at Contractor's option.

END OF SECTION 08 90 00

SECTION 09-2100 – GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide gypsum drywall as shown on the drawings and as herein specified including but not limited to: Metal stud framing, suspended ceiling systems, gypsum drywall and finishing systems.
B. Related Sections include the following:
   1. Division 5 Section “Cold Formed Metal Framing.”
   2. Division 6 Section “Rough Carpentry.”
   3. Division 6 Section “Wood Framing.”
   4. Retain if required for CHPS, possibly other green building requirements:
   5. Division 6 Section “Architectural Woodwork", for coordination of metal framed cabinet supports.
   6. Division 7 Section “Thermal Insulation.”
   7. Division 7 for additional requirements for fire stopping and sealants installed with gypsum board assemblies.
   8. Division 9 Section “Metal Support Systems.”
   9. Division 9 Section “Acoustical Insulation.”
   10. Division 9 Section “Painting.”
   11. Division 9 Sections, for coordination of tiling, wall base materials, and other finishes applied to gypsum board assemblies.
   12. Divisions 10 and 11, and other Sections as applicable, for coordination of accessories and equipment requiring blocking in walls. Submittals

1.03 SUBMITTALS

A. Product Data: For the following:
   1. Gypsum wallboard.
   2. Gypsum board, Type X.
   3. Flexible gypsum board.
   4. Gypsum ceiling board.
   5. Foil-backed gypsum board.
   6. Abuse-resistant gypsum board.
   7. Impact-resistant gypsum board.
   8. Mold-resistant gypsum board.
   9. Gypsum board, Type C.
   10. Glass-mat interior gypsum board.
   11. Acoustically enhanced gypsum board.
   12. Skim-coated gypsum board.
   13. Glass-mat, water-resistant backing board.
   14. Cementitious backer units.

15. Water-resistant gypsum backing board.
16. Interior trim.
17. Exterior trim.
18. Aluminum trim.
19. Joint treatment materials.
20. Laminating adhesive.
21. Sound-attenuation blankets.
22. Acoustical sealant.
23. Textured finishes.

B. Samples for Verification: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.
   2. Textured Finishes: approximately 12" square for each interior paint color indicated.

1.04 INFORMATIONAL SUBMITTALS:

A. Certificate:
   1. Furnish certificate evidencing that material meets or exceeds specification and fire rating requirement.

B. Research/Evaluation Reports: Evidence of cold-formed metal framing's compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
   1. Evaluation reports certified under an independent third-party inspection program administered by an agency accredited by IAS to ICC-ES AC98, IAS Accreditation Criteria for Inspection Agencies.

1.05 QUALITY ASSURANCE

A. Metal Support Standard: ASTM C754.
B. Metal Stud Standard: Fed Spec QQS-698 and QQS-775d, Class D.
C. Gypsum Board Standard: GA 216 by Gypsum Association.
D. Tolerances: 1/8" Offsets between planes of board faces and 1/4" in 8'-0" for plumb, level, warp and bow.
E. Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and qualities of materials and execution.
   1. Install mockups for the following applications:
      a. Surfaces indicated to receive nontextured paint finishes.
   2. Simulate finished lighting conditions for review of mockups.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.06 PREINSTALLATION MEETINGS

1. Conduct conference at Project site to comply with requirements in Division 01 Section - Project Management and Coordination.
2. Required attendees include:
3. Owner's Representative
   a. General Contractor Superintendent
   b. Drywall Installation sub-contractor Superintendent
   c. Mechanical, electrical and plumbing systems superintendents
   d. Architect
4. Coordinate support framing and blocking requirements of all construction to be attached to gypsum board assemblies.
5. Coordinate ceiling suspension anchorage, sprayed fireproofing, ceiling access panel locations and ceiling mechanical electrical and other ceiling systems.

6. Delete the following paragraph when sheathing and air-barrier are specified elsewhere. Modify as required.
7. Status of action submittals.
8. General Contractor to maintain and distribute meeting minutes.

1.07 PERFORMANCE / DESIGN CRITERIA

A. Acoustic Ratings: Construct assemblies to achieve acoustic ratings indicated on Drawings, assemblies tested to ASTM E90 and classified in accordance with ASTM E 413 by an independent testing agency.
B. Deflection Limits:
   1. Limit deflection of partitions to following limits, based on design load.
      a. Partitions to receive tile, plaster, adhered stone, or similar heavy finish materials: L/240**.**
      b. Other partitions: L/120**.**
      c. Comply with minimum stud gauges required elsewhere in these specifications, the most stringent requirement shall prevail. If partition height exceeds stud manufacturer's limiting height for applicable loading and deflection, install bracing above ceiling, decrease stud spacing, or increase stud gauge.
   2. Limit deflection of ceilings to L/360.
C. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by, and displaying a classification label from, an independent testing agency acceptable to the authority having jurisdiction.
   1. Fire-Resistance-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."
   2. Construct assemblies to achieve fire resistance ratings indicated on Drawings, in accordance with applicable UL design numbers.
   3. In the event that requirements of assembly numbers referenced conflict with other Contract Document requirements, conform to assembly requirements.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials with manufacturer's label attached. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging. Protect materials from dampness or wetting. Remove any damaged materials.
B. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

1.09 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
   1. Gypsum Board and Related Products:
      a. G-P Gypsum Corp.
      b. National Gypsum Company.
      c. United States Gypsum Co. (USG)

2.02 FRAMING MATERIALS AND ACCESSORIES

A. Components, General: As follows:
   1. Comply with ASTM C 754 for conditions indicated.
   2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with
B. Hat Shape Furring Channels: ASTM C 645, 7/8" x 1-1/4", 22 gauge, galvanized steel hat shaped sections.
C. Framed openings: Galvanized steel one piece header and jamb studs meeting or exceeding the requirements of ASTM C 754.
D. Blocking and Backing Plates: Refer to Division 06, Section "Rough Carpentry". At Contractor's option, the following blocking types may be provided in lieu of fire rated wood blocking, provided that the material will meet the most stringent strength requirements for each item to be attached to such blocking.
E. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.03 GYPSUM WALLBOARD PANELS

A. General: Specifications based on materials and manufacturers listed are to set quality standard. Subject to compliance with requirements, provide the named products, or comparable products by another manufacturer.
B. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
C. Gypsum Wallboard: ASTM C 1396 unless otherwise indicated.
   1. Type X:
      a. Thickness: 5/8”.
      b. Long Edges: Tapered.
      c. Location: Typical where other wallboard type is not otherwise indicated.
   2. Type C:
      a. Thickness: 5/8”.
      b. Long Edges: Tapered.
      c. Location: Fire rated ceilings.
   3. Moisture and Mold Resistant: With moisture and mold resistant core and paper surfaces, mold resistance ASTM D 3273, score of 10 as rated according to ASTM D 3274.
      a. Thickness: 5/8”.
      b. Long Edges: Tapered.
      c. Location: At restrooms, laundry, extractor, commercial kitchen areas, custodial, and similar wet and washable locations, except for backer board installed behind tile.
   4. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.
      a. Products: Subject to compliance with requirements, provide Georgia-Pacific Gypsum LLC; DensArmour Plus or approved equal:
      b. Core: As indicated.
      c. Long Edges: Tapered.
      d. Mold Resistance: ASTM D 3273, score of 10.
      e. Location: At bottom 3" (min.) above slab at gypsum board partition walls.

2.04 TILE BACKING PANELS

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325.
   1. Products: Subject to compliance with requirements, provide one of the following or other approved equal:
      a. Custom Building Products; Wonderboard.
      b. United States Gypsum Co.; DUROCK Cement Board.
   2. Thickness: As indicated.

2.05 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbeads: Equal to USG Dur-A-Bead. Use at outside corners.
      b. Metal Edge Trim: Standard trim of galvanized steel with either knurled and perforated or expanded flanges and beaded for concealment of flange in joint compound. Equal to USG 200 or 400 Series. Apply where board abuts or terminates at another material.
         1) L-Bead: L-shaped; exposed long flange receives joint compound; use at exposed panel edges.
         2) J-Mold: Metal J-molds; exposed flange receives joint compound, use at all panel edges abutting dissimilar materials.
      c. Gypsum Control Joints: Metal V-shape control joints. Use where indicated and at changes in backup material and in partitions at 30’-0” o.c. maximum, and at large gypsum board ceiling areas at 20'-0" o.c. maximum. Also provide at both sides all interior and exterior window & door frames.

2.06 INTERIOR WALLBOARD JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.
B. Joint Tape:
   1. Interior Gypsum Wallboard: Paper.
   2. Tile Backing Panels: As recommended by panel manufacturer.
      a. Use polymer-coated (alkali-resistant) mesh tape, 2” wide at interior applications, and 3” wide at exterior applications.
C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound, equal to USG Durabond 90.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound, equal to USG Durabond Joint Taping Compound.
   3. Fill Coat: For second coat, use drying-type, all-purpose compound, equal to USG Ready Mixed Joint Topping.
   4. Finish Coat: For third coat, use drying-type, all-purpose compound.
   5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
D. Joint Compound for Tile Backing Panels:
   1. Cementitious Backer Units: As recommended by panel manufacturer.

2.07 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, manufacturers offering products which may be incorporated into the work include the following:

1. Acoustical Sealant for Exposed and Concealed Joints:
    a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
    b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.
2. Acoustical foam sealant may be used to fill voids to decking or other similar conditions above ceilings.

B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant**,** complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.08 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Door frame Grout: Equal to USG Durabond 90 Joint Compound, Multi-Purpose.

D. Sealer Gaskets: 5-12" x 3/8" closed cell foam and adhesive backed peel and stick membrane, equal to Protecto Wrap (800-759-9727) "Triple Guard Energy Sill Sealer." Provide at all exterior metal studs in contact with floor slab.

E. Hanger Wire: ASTM A 641, 9 Gauge galvanized steel wire.

F. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

G. Insulation:
1. Thermal Insulation: Refer to Division 07, Section "Thermal Insulation".
2. Acoustical Insulation: Refer to Division 09, Section "Acoustical Insulation".
3. Fire Resistant Assemblies: Provide mineral fiber insulation according to the requirements of the fire rated assembly, except where greater thickness is indicated for partitions that also carry an acoustical rating.

2.09 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Aggregate Finish: Water-based, job-mixed, aggregated, drying-type texture finish for spray application.
1. Texture: Light spatter.

C. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.
1. Texture: Orange Peel.

PART 3 - EXECUTION

3.01 EXAMINATION AND COORDINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
C. Interface and Coordination with Other Work:
    1. Coordinate installation of firestopping at penetrations through fire-resistive rated assemblies.
    2. Coordinate installation of joint sealers specified in Division 7 Section at penetrations of non fire-resistive rated assemblies.
    3. Coordinate support framing and blocking requirements of all construction to be attached to gypsum board assemblies.
    4. At partitions indicated to receive thermal or acoustical batts, pack insulation into cavities while framing is being fabricated for stud packs, box headers, and other framing cavities that will be inaccessible upon erection of framing.
    5. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
        a. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION – INTERIOR WALL BOARD PANEL ERECTION

A. General: Comply with ASTM C840.
B. Panel Installation:
    1. Use wallboard and sheathing of maximum lengths to minimize joints.
    2. Stagger end joints where they occur.
    3. Stagger vertical joints on opposite sides of partitions, and stagger joints between each layer of panel in multiple layer installations, by at least one framing member.
        a. Exception: Do not bridge panels over expansion joints.
    4. Locate end joints as far as possible from center of wall or ceiling.
    5. Do not place butt ends against tapered or grooved edges. Do not place tapered edges against cut edges or ends.
    6. Support ends and edges of wallboard on framing or furring members.
    7. No wallboard installed over piping, ducts, electric boxes or conduits until they have been installed, run and tested.
    8. Attach wallboard and sheathing with screws spaced 12" O.C. and staggered along abutting vertical edges.
    9. Exterior grooved sheathing installed horizontally with tongue up.
    10. Partitions indicated sealed to deck shall be continuous except where interrupted by structure, mechanical or electrical construction.
    11. Fit gypsum panels around ducts, pipes, conduits, and structural members. Cut panels to fit profile of penetrations and apply a bead of sealant 1/4" to 3/8" wide.
    12. Tape and float only is acceptable behind lockers that have solid backs unless otherwise required for partition fire or acoustical ratings.
    13. Rated partitions shall have wall board continuous both sides above ceiling to deck and fire taped and sealed.
    14. Partitions shown to include sound batt but not to extend to deck shall have wall board continuous to deck above ceiling and taped on one side only.
        a. Exception: Partitions shown to have acoustical insulation placed over ceiling to either side of the partition wall.
    15. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, including floors and deck. Provide 1/4- to 1/2-inch wide spaces at these locations. Trim edges with edge trim where edges of panels will be exposed in the

completed work. Seal joints between edges and abutting structural surfaces with acoustical sealant

16. Form control and expansion joints with space between edges of adjoining panels.
17. Refer to Division 07, Section "Expansion Control" for installation of expansion control joints and expansion joint covers located within or adjacent to gypsum board assemblies.

C. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

D. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

E. Wall Tile Substrate: ANSI A108.11
   1. Install tile backer board as substrate for thin set ceramic tile.
   2. Space 1/4" above fixture lips.
   3. Seal ends, cut edges and penetrations of each piece with water resistant compound before installation.
   4. Tape & mortar over all joints prior to tile installation.

F. Accessory Installation:
   1. Corner Beads: Install on external corners with suitable fasteners spaced 9" O.C.
   2. Metal Trim: Install over face layer with fasteners spaced 9" O.C. where shown and where gypsum surfaces meet dissimilar materials.
   3. Control Joint: Install control joints in locations where detailed, and the following, unless otherwise indicated:
      a. At changes in backup material.
      b. Vertically in partition walls at 30'-0" maximum on center.
      c. Horizontally in partition walls taller than 16'. Confirm elevations of such joints with Architect.
      d. In large ceilings 20'-0" maximum on center each way.
         1) Also at perimeter of ceilings in Apparatus Bay.
      e. At interior side of all exterior door and window frames.
      f. At both sides of all interior and exterior door and window frames.

G. Joint Treatment Application:
   1. Joint treatment compounds and products, as specified under Materials, shall be mixed and applied in accordance with manufacturer's direction to completely conceal all joints and screw depressions and provide a smooth surface to receive finishes as scheduled.

3.03 CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.04 INTERIOR WALLBOARD FINISH

A. Apply gypsum board finish in accordance with ASTM C 840, manufacturer's published instructions and GA-214 Finish Levels.
   1. Level 1: All joints and interior angles shall have tape embedded in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.
      a. Application: In plenum areas above ceilings, in attics, in mechanical rooms, and in other areas where the assembly is generally concealed and not normally open to view. Accessories not required unless otherwise indicated or required by fire rated or acoustical rated construction.

1) Where a fire resistance rating is required for the gypsum board assembly, details of construction shall be in accordance with reports of fire tests of assemblies that have met the fire rating requirement.
2) Where acoustical rating requires more stringent finish application, comply with acoustical partition construction requirements.

2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges and sand joints. Provide level 2 finish where panels are substrate for tile, behind plywood backer boards, in mechanical and electrical rooms and where specifically indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
3. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface, and sand smooth. Provide Level 4 finish typical, where panels are to receive painted finish unless specifically indicated otherwise.
   a. Texture for level 4 finish: Light orange peel texture, or other light texture as approved by Architect through sample and mockup review.
4. Prepared surfaces shall be coated with a primer/sealer prior to the application of finish paint. Refer to specification Division 9 Section for painting.
   a. Application: For use where gloss semi-gloss, enamel, eggshell, or non-textured flat paints are specified or where severe lighting conditions occur. Generally in all areas except where noted otherwise.

3.05 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.
C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.06 FIELD QUALITY CONTROL

A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
   1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
   2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
      a. Installation of 80 percent of lighting fixtures, powered for operation.
      b. Installation, insulation, and leak and pressure testing of water piping systems.
      c. Installation of air-duct systems.
      d. Installation of air devices.
      e. Installation of mechanical system control-air tubing.
      f. Installation of ceiling support framing.

3.07 PATCHING AND REPAIR

A. Remove and replace gypsum board panels that become wet, moisture damaged, or exhibit evidence of mold.

3.08 CLEANING

A. Contractor shall completely clean all areas affected by this work and shall leave no excess or scrap materials or bedding compound on the job site.

END OF SECTION 09 21 00

SECTION 09-3013 – CERAMIC TILING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. This Section includes the following:
   1. Ceramic tile.
   2. Provide / replace tile to match existing historical tiles.
   3. Stone thresholds installed as part of tile installations.
   4. Crack suppression membrane for thin-set and medium set tile installations.
   5. Waterproof membrane for thick-set tile installations.
   6. Cementitious backer units installed as part of tile installations.
   7. Metal edge strips installed as part of tile installations.
B. Related Sections include the following:
   1. Division 03 Section "Cast-in-Place Concrete".
   2. Division 03 Section "Hydraulic Cement Underlayment".
   3. Division 07 Section "Joint Sealants" for additional quality standards for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
   4. Division 07 Section "Expansion Joint Covers" for expansion covers installed in tiling.
   5. Division 08 Section "Access Doors and Panels" for coordination with access doors and panels installation.
   6. Division 09 Section "Gypsum Board Assemblies" for cementitious backer units.
   7. Division 09 Section "Flooring" Sections for transition strips other than those specified in this Section.
   8. Division 10 Section "Toilet Accessories", and other sections as applicable, for coordination of recessed items installed in tiled walls.
   9. Division 22, for coordination with plumbing fixtures, shower base units, floor drains.

1.03 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).
C. Facial Dimension: Nominal tile size as defined in ANSI A137.1.

1.04 REFERENCE STANDARDS

A. TCA / TCNA: Tile Council of North America, Inc., and the TCNA Handbook for ceramic, glass, and stone tile installations, most current versions.
B. ANSI A108.01, Requirements for movement joints.
C. Marble Institute of America (MIA): Dimension Stone Design Manual for Expansion Joints.
D. ASTM C1242, Standard guide for selection, design, and installation of dimension stone attachment systems.
E. ASTM C1193, Standard guide for the use of joint sealants.

F. ASTM C1472, Standard guide for calculating movement and other effects when establishing sealant joint width.

1.05 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as tested per the DCOF AcuTest (ANSI A137.1):
   1. Level Surfaces: Minimum 0.42.
B. All sealants used in floor or traffic applications shall have a Shore A hardness not less than 35.

1.06 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
C. Samples for Initial Selection: For each type of tile indicated. Submit complete line of grout color for selection by Architect. Include Samples of accessories involving color selection.
D. Samples of existing-tile match: For color matching of existing tile, submit tile-matched samples of those original tiles that are part of the restorative work. Obtain Architects approval prior to ordering of all tiles for the project.
E. Samples for Verification:
   1. Full-size units of each type and composition of tile and for each color and finish required.
   2. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
   3. Full-size units of each type of trim and accessory for each color and finish required.
   4. Stone thresholds in 6-inch lengths.
   5. Metal edge strips in 6-inch lengths.

1.07 INFORMATIONAL SUBMITTALS

A. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
B. Product Certificates: For each type of product, signed by product manufacturer stating products are suitable for intended application.
C. Qualification Data: For Installer.
D. Material Test Reports: For each tile-setting and -grouting product and special-purpose tile.
E. Letter from sealant manufacturer, stating suitability of products for each application indicated.

1.08 QUALITY ASSURANCE

A. Qualifications of Installers: For cutting, installing and grouting of ceramic tile, use only thoroughly trained and experienced journeyman tile setters who are completely familiar with the requirements of this work, and the recommendations contained in the referenced standards, and who are CTI, CTEF, ACT, or TCNA 5-Star TCAA Trowel of Excellence certified.
B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with the following:
   1. Grout and mortar setting shall comply with, ANSI A108.4 and ANSI A 108.5.
   2. Manufacture all ceramic tile in accordance with Standard Grade Requirements of ANSI 137.1.
   3. ANSI A118.10, Specifications for waterproof membranes
   4. ANSI A118.12 Specifications for Crack Isolation Membranes

5. Install all ceramic tile in accordance with the recommendations contained in Handbook for Ceramic Tile Installation of the Tile Council of North America, Inc., latest edition.

C. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.
   1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.

D. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer. Including self-leveling underlayments and waterproofing / anti-fracturing membranes.

E. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
   1. Stone thresholds.
   2. Waterproofing.
   3. Joint sealants.
   4. Cementitious backer units.
   5. Metal edge strips.

F. Mockups: Build mockups to demonstrate aesthetic effects.
   1. Build mockup of each type of floor tile installation.
   2. Build mockup of each type of wall tile installation.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
   4. View mockup under permanent lighting conditions.

G. Where existing tile is to be color-matched, preserve as much existing tile as possible.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store liquid latexes and emulsion adhesives in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.11 MAINTENANCE MATERIALS

A. Furnish extra materials that are from same production runs as products installed, that match products installed, and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The following requirements apply for product selection:
   1. Basis-of-Design Product: The design for each tile type is based on the product named. Subject to compliance with requirements, provide either the named product or an approved comparable product by another manufacturer.

2.02 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
   2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.
C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the specified product:
D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
E. Warpage: No more than one-tenth the length of the measured span of the tile can exhibit more than 25 percent of total allowable warpage.

2.03 TILE PRODUCTS

A. Available Suppliers whose products may be incorporated into the work include but are not limited to the following:
   1. As scheduled for new tile.
B. Wall Porcelain Tile: Glazed porcelain ceramic tile. Size and type as indicated on drawings.
C. Floor Tile: Porcelain tile. Size and type as indicated on drawings.
D. Trim & Special Tile: Provide necessary caps, stops, coves, returns, trimmers, and other shapes as required for a complete installation. Items to be supplied by the same manufacturer supplying the tile.
E. Cove Base: Porcelain tile. Base to match tile color to be selected for the floor. Size and type as indicated on the drawings.
F. Ceramic Tile: Flat tile as scheduled on drawings.
G. Cap Tile at half-height wall: Provide custom cap tile with rounded edges, to match adjacent glazed tile.

2.04 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
   1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.
B. Stone Thresholds: ASTM C 615 with honed finish.

1. Stone or Marble: In thicknesses as required for installation indicated in part 3 and as detailed in Drawings. Uniform, fine to medium-grained stone or marble in color as selected by Architect. Bevel edges at 1:2 slope. Align lower edge of bevels with adjacent floor finishes.
    a. Where a stone threshold is indicated for 3'x5' handicap accessible showers, provide threshold without any bevel and sized for flush installation.

2.05 CRACK ISOLATION MEMBRANE FOR THIN-SET FLOOR TILE INSTALLATIONS

A. Basis of Design Products: Design is based on products indicated. Subject to compliance with requirements; provide one of the named products, or an approved equal substitution.
B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.
    1. Crack Isolation Membrane: ANSI A118.12:
        a. Custom Building Products;. Fracture-Free Crack Isolation Membrane.
        b. Laticrete; Blue 92 Anti-Fracture Membrane
        c. MAPEI; Mapelastic CI

2.06 WATERPROOFING MEMBRANES FOR THICK-SET TILE INSTALLATIONS

A. Basis of Design Products: Design is based on products indicated. Subject to compliance with requirements; provide one of the named products, or an approved equal substitution.
B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement.
    1. Waterproofing Membrane: ANSI A118.10:
        a. LATICRETE International, Inc.; Laticrete 9235 Waterproof Membrane.
        b. TEC – Hydraflex, Waterproofing Crack Isolation Membrane
        c. MAPEI; Mapelastic 400 Waterproof Membrane.

2.07 WATERPROOFING FOR THIN-SET TILE INSTALLATIONS

A. General: Manufacturer’s standard product that complies with ANSI A118.10, selected from the following;
B. Waterproofing Membrane (Concrete Slabs).
    1. Flexible load-bearing, self-curing liquid rubber polymer and reinforcing fabric to form a seamless, heavy-duty waterproof membrane below a protective surface. Provide continuously under floor tile and behind wall tile:
        a. Laticrete; “9235”
        b. MAPEI; Mapelastic 400
    2. Provide reinforcing membranes at floor to vertical surfaces, throughout shower pan and wall lining to the full height of the wall tile, and for other conditions as recommended by Manufacturer for the waterproofing system indicated.
    3. At curbless shower installations, extend membrane 1'-0" beyond shower enclosure.
C. Waterproofing and Uncoupling Membrane (Wood or Plywood Deck).
    1. Flexible polyethylene membrane with grid structure of square dovetail cavities, with anchoring fleece laminated to the underside.
        a. Schluter “Ditra”, as manufactured by Schluter-Systems L.P., Plattsburgh, NY (800) 472-4588.
        b. Laticrete “Strata_Mat”, as manufactured by Laticrete International, Inc., Grand Prairie, TX (972) 641-3266.

2.08 SETTING MATERIALS

A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:
    1. Custom Building Products.

2. LATICRETE International Inc.
3. MAPEI Corporation.

B. Portland Cement Thickset Mortar Installation Materials: ANSI A108.02.
   1. Thickset Bed Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A 185/A 185M and ASTM A 82/A 82M, except for minimum wire size.

C. Latex-Polymer Modified Portland Cement Mortar (Thin Set) for Wall and Floor: ANSI A118.4, consisting of the following:
   1. Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site. Available products include the following:
      a. MAPEI; Ultraflex 2
      b. Custom Building Products; VersaBond Flex
      c. Laticrete; 253 Gold
   2. For wall applications, provide mortar that complies with requirements for nonsagging mortar, ISO 13007; C2TE, in addition to the other requirements in ANSI A118.4.
   3. For thin-set application of large format tiles use LHT mortar.

D. Dry-Set Mortar for Large and Heavy Tile (LHT) large format tile Floors and Walls: Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of 3/32" to 1/2".
   1. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
      a. MAPEI; Ultraflex LFT.
      b. Custom Building Products; Natural Stone and Large Tile Premium Mortar.
      c. Laticrete; 4-XLT.
      d. TEC; Ultimate 6 Plus LHT Mortar
   2. Provide prepackaged, dry-mortar mix combined with liquid-latex additive at Project site.
      a. MAPEI; Kerabond / Keralastic.
      b. Custom Building Products; Custom Blend / Custom Flex.
      c. Laticrete; 315 / 333.
      d. MAPEI; Ultraflex LFT Rapid.
      e. Custom Building Products; MegaLite RS.
      f. Laticrete; 254 Rapid.

2.09 GROUT MATERIALS:

A. Polymer-Modified Tile Grout: ANSI A118.7, in color as selected by Architect.
   1. Polymer Type: Either ethylene vinyl acetate, in dry, re-dispersible form, prepackaged with other dry ingredients, or acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
   2. Use hydraulic cement sanded grouts for joints 1/8 inch and wider. Available Products:
      a. MAPEI; Keracolor S
      b. Laticrete; 1500 Sanded Grout
      c. Custom Building Products; Polyblend
   3. Use unsanded grout for joints less than 1/8 inch in width. Available Products:
      a. MAPEI; Keracolor U.
      b. Laticrete; 1600 Unsanded Grout.
      c. Custom Building Products; Polyblend Nonsanded.

2.10 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.
C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
    1. Where Grout Manufacturer's sealants meet requirements throughout, use Grout Manufacturer's matching color sealants for sealant joints between tiles. Available Products:
        a. MAPEI; Mapesil.
        b. Laticrete; Latasil.
        c. Custom Building Products; Commerical 100% Silicone Caulk.
    2. Other Available Products may include:
        a. Dow Corning Corporation; Dow Corning 786.
        b. GE Silicones; Sanitary 1700.
        c. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
        d. Tremco, Inc.; Tremsil 600 White.
D. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.
    1. Available Products:
        a. MAPEI; Mapeflex P1 SL.
        b. Bostik; Chem-Calk 550.
        c. Mameco International, Inc.; Vulkem 245.
        d. Pecora Corporation; NR-200 Urexpan.
        e. Tremco, Inc.; THC-900.
E. Joint Backers: Foam joint backer material to prevent sealant bond and form recommended joint cross-sectional shape. Round or rectangular with rounded top, and in sizes as appropriate to joint sizes and conditions.

2.11 CEMENTITIOUS BACKER UNITS

A. Provide 5/8” cementitious backer units at all walls to receive tile and on top of plywood subfloor/deck to receive waterproofing and tile All walls in wet areas complying with ANSI A118.9 in maximum lengths available to minimize end-to-end butt joints re: Division 09 Section “Gypsum Board Assemblies.”

2.12 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
B. Tile Lippage Control System: Tile installation system designed to minimize or eliminate tile lippage in floor and wall installation. Raimondi Lippage System or other system acceptable to large format ceramic tile Manufacturer for eliminating lippage in installation of their tile. Use in the following locations:
    1. At all large format ceramic tiles, both in floor and wall installation applications.
C. Metal Edge Strips: Metal edge strips with flange for embedding in tile setting material. Provide shapes as noted below, in sizes to match tile and setting-bed thickness and adjacent finish materials at transitions. Subject to compliance with requirements, provide metal strips as manufactured by Schluter**,**
    1. Ceramic Tile to LVT: "RENO-U" by Schluter. Finish: Brushed Antiqued Bronze.
    2. Ceramic Tile to Concrete, or other lower floor material: RENO-RAMP by Schluter. Finish: Satin Anodized.
    3. Top edges of tile (that do not go to ceiling): "JOLLY" by Schluter. Finish: Brushed Antiqued Bronze.

4. Premanufactured Shower Basin to wall tile: "DILEX-AHKA" by Schluter.
    a. Finish: Bronze.
    b. Provide connectors, end caps, and inside and outside corner kits. Where there is adjacent vertical tile trim, select corner kits to match the adjacent vertical trim.
5. Tile Outside Corners: "JOLLY" by Schluter. Finish: Brushed Antiqued Bronze. Include universal accessory pieces for inside and outside corners, and end caps.
6. Inside Corners shall be soft tile sealant joints to match grout color.
7. Sealant movement joints shall be soft tile sealant joints to match grout color.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color, sheen, or appearance of grout.
1. Available Products:
    a. MAPEI Corporation; Ultracare Penetrating Tile, Stone, and Grout Sealer.
    b. Custom Building Products; Aquamix Penetrating Sealer.
    c. C-Cure; Penetrating Sealer 978.

2.13 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
B. Add materials, water, and additives in accurate proportions.
C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Contractor shall apply leveling coat or dry-set mortar over wall and floor surfaces which may vary more than 1-inch in 10 feet. Installation constitutes acceptance of the substrate.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
D. Where existing tile is to be color-matched, preserve as much of the existing original tile installation as possible. Remove only damaged, discolored or mismatched tile, or previous patches of inferior quality.

3.02 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors, installed with adhesives or thin-set mortar that complies with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
   1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
   2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.03 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
   1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
      a. Tile floors in wet areas.
      b. Tile floors composed of tiles 8 by 8 inches or larger.

B. TCNA Installation Guidelines: TCNA's "Handbook for Ceramic Tile Installation." Comply with TCNA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints per approved shop drawings, and in compliance with TCNA handbook recommendations where indicated during installation of settings materials, mortar beds, and tile. Do not saw-cut joints after installing tiles. Do not allow grout, setting materials, or other hard materials to restrict movement or bridge across at movement joints.
   1. Install sealant materials per manufacturer's installation instructions and industry standards. Clean and prime surfaces as recommended by manufacturer. Do not exceed temperature limitations, including where required shading of joints until after cured where joints are exposed to direct sunlight.
   2. Locate joints at inside corners, in tile surfaces directly above joints in concrete substrates, and per reference standards.
   3. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."
   4. Install movement joints with appropriate joint backer material.
   5. Install movement joints per details in TCNA EJ171, except where pre-fabricated joint profiles are indicated.
   6. Sealant profile shall be slightly concave.
   7. In general, movement joints are recommended at 25’ each direction at interior spaces. Tile work exposed to direct sunlight, heat or moisture should place movement joints at 12’ maximum each direction.

G. Grout tile to comply with requirements of the following tile installation standards:
   1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.
   2. For chemical-resistant epoxy grouts, comply with ANSI A108.6.
H. Where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.04 ANTI-FRACTURE AND WATERPROOFING MEMBRANES INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.
B. Install water proofing membrane under and behind floor tile and turned up 9" vertical behind wall tile at restrooms and bathrooms. Also install waterproofing at floor drains, over tile backer board and moisture resilient board at wall base and plywood subfloor, and over other concrete floor substrates.
   1. At showers, install waterproofing system throughout the shower including behind wall tile, and extend waterproofing system behind adjacent tile at least 9" beyond the shower on all sides.
C. Install Anti-Fracture membrane at all floor tile not otherwise indicated for waterproofing membrane installation.
   1. Anti-fracture membrane shall not be installed as a substitute for movement joints or expansion joint covers across building movement joints. Comply with TCNA standards.
D. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.
   1. Stop up shower drains and flood shower pans to test waterproofing to be leak-free for minimum of 24 hours duration, or greater where required by authorities having jurisdiction, prior to tile installation.

3.05 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCNA installation methods and ANSI A108 Series of tile installation standards.
   1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
      a. Tile floors composed of tiles 8 by 8 inches or larger.
B. Joint Widths: Install tile on floors with the following joint widths:
   1. Ceramic Tile: 1/8 inch.
   2. Unless otherwise approved by Architect, accurately cut tile to install with joint widths between tile and floor drains, floor sinks, and similar items in floors, to the same joint widths as in the tile field.
C. Tile Pattern: As indicated in Drawings.
D. Metal Edge Strips: Provide at locations other than restrooms where exposed edge of tile flooring meets carpet, wood, vinyl composition tile, or other flooring that finishes flush with top of tile. Install with setting flanges embedded in the tile setting material.
   1. Use full length pieces to the extent possible in order to minimize the number of joints.
   2. Unless otherwise noted, install edge strips flush with faces of tile to within maximum lippage tolerances as specified for tile.
   3. Backfill edge strips solidly with tile setting mortar behind cove bases, stair edges, ramp transitions, and similar metal tile trim accessories that have void spaces.
E. Grout Sealers: Apply grout sealer to cementitious grout joints according to grout-sealer Manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.06 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCNA installation methods and ANSI setting-bed standards.
B. Joint Widths: Install tile on walls with the following joint widths:
   1. Ceramic Tile: 1/8 inch.
C. Tile Pattern: As indicated in Drawings.
D. Coved and Base Tile: Where special shaped coved or base tile is indicated, install special shaped tiles with the toe of the cove properly aligned with adjacent floor tile and the face of the tile properly aligned with adjacent wall tile to within tolerances indicated, to within the maximum tolerances specified for tile lippage at both surfaces.
   1. At junctions of cove bae tile with floor tile, ensure cove base is not recessed relative to adjacent floor tile in a manner that would trap water deeper than the allowed lippage.
   2. Where cove base is available with outside corner pieces, provide and install outside corner pieces at all outside corners. Otherwise, neatly miter cove tile at corners.
   3. Install adjacent pieces at inside and outside corners to within the maximum lippage as specified.
E. Metal Trim Strips: Install at all locations indicated or as required to conceal exposed edge of tile:
   1. Use full length pieces to the extent possible in order to minimize the number of joints.
   2. Unless otherwise noted, install edge strips flush with faces of tile to within maximum lippage tolerances as specified for tile.
   3. Install all strips and transitions set in mortar beneath tile, and per manufacturer's instructions.
   4. At top of tile wainscots and other exposed edges of wall tile, install caulk joint between metal trim and wall. Do not grout to wall. Coordinate color with Architect and adjacent finishes.
   5. Metal Trim at Showers: Install according to Manufacturer's instructions and as follows:
      a. Unless otherwise detailed in Drawings, the open side of handicap accessible showers should be installed with metal trim edge creating a sloped lip 1/4" (minimum) to 1/2" (maximum) in total height, and compliant with ADA. Install trim at open side of shower flush with floor tile, and the low side of the trim flush with sloping tile inside the shower pan.
      b. Install adjustable rake trim at rake sides of shower, with face of trim flush with wall tile above.
      c. Install trim at low, slot drain side of shower with the top of trim aligned with the adjacent rake trim pieces.

3.07 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.08 FLOOR TILE INSTALLATION SCHEDULE

A. Tile Installation F112: Interior floor installation on concrete; LHT mortar on crack isolation or waterproofing membrane; TCNA F112.
   1. Locations: At Large and Heavy Tile.
   2. LHT Mortar: Latex-portland cement mortar.
   3. Grout: Polymer modified sanded grout.
   4. Membrane: Use crack isolation membrane typical except use waterproofing membrane at restrooms and within 2' of floor drains.

B. Tile Installation: Interior floor installation on concrete; thin-set mortar on crack isolation membrane; TCNA F125-Full.
   1. Locations: **Typical unless otherwise noted.**
   2. Thin-Set Mortar: Latex-portland cement mortar.
   3. Grout: Polymer modified sanded grout.
   4. Membrane: Use crack isolation membrane typical except use waterproofing membrane at restrooms and within 2' of floor drains

3.09 WALL TILE INSTALLATION SCHEDULE

A. Tile Installation W244C: Interior wall installation over cementitious backer units; thin-set mortar; TCNA W244C.
   1. Location: As indicated at locations other than showers.
   2. Thin-Set Mortar: Latex-portland cement mortar.
   3. Grout: Polymer modified sanded grout

END OF SECTION 09 30 13

SECTION 09-5100 – ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide acoustical ceilings as shown on the drawings and as herein specified.
B. Related Sections include the following:
   1. Division 09 Section - Non-Structural Metal Framing.
   2. Division 09 Section - Gypsum Board Assemblies
   3. Division 21 through 28 Mechanical and Electrical Sections, for coordination with devices installed in grid ceilings.

1.03 QUALITY ASSURANCE

A. Fire Hazard Classification: Maximum flame spread, Class A (less than 25) as tested in accordance with ASTM E-84 and per Fed. Spec. SS-S-118a.

1.04 SUBMITTALS

A. Product Data: Manufacturer's product specifications and installation instructions for each acoustical ceiling material required, and for each suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications.
B. Samples: Set of 4" x 4" square samples for each acoustical unit required, showing full range of exposed color and texture to be expected in completed work.

1.05 COORDINATION

A. Contractor shall coordinate connection of lighting and electrical devices to grid. Where lighting fixtures are provided with integral clips, install lighting fixture with the clip attachments and not with screws through grid tees.

1.06 MAINTENANCE MATERIALS

A. Provide 3% full tiles, each type (minimum one box) each color, texture and style of ceiling tiles.

PART 2 - PRODUCTS

2.01 CEILING TILE AND GRID

A. Acoustical Panels:
   1. Type ACT4: 24" x 24" x 5/8" mineral fiber tile made for a lay-in grid suspension system. Panel design is Armstrong #1774 "Dune", with Angled Tegular edge profile, Color: White.
      a. Use with Grid **Type 1**.

B. Lay-in suspension system: Exposed steel members made for use with panel types specified. System supplied with all main runner tees, cross tees, wall angles, clips, connectors, fastening and hangar wires.
   1. Grid Type 1: Grid to be 24" x 24" pattern with white finish. Armstrong's "Prelude ML" 15/16" exposed tee, or approved equal.

2.02 MISCELLANEOUS MATERIALS

A. Uplift Bracing and Retention Clips: Provide uplift bracing and retention clips designed to prevent tiles from dislodging due to wind or air pressure changes at exterior grid, grid in airlock vestibules, and in similar locations subject to wind or sudden changes in air pressure.
   1. Provide retention clips at all plank type tile as recommended by Manufacturer.
      a. Equal to Armstrong Universal Hold-Down clip for typical air pressure uplift locations unless otherwise recommended.
B. Edge Treatment for cut edges of tegular and grooved edge ceiling tiles and planks: Manufacturer's recommended touch up paint.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ceiling grids and acoustical panels completely installed in all areas indicated. Ceiling plenum shall be completely enclosed from adjoining conditioned space by structure, partitions, and/or acoustical panels.
B. Suspension systems installed by direct suspension from structural systems in accordance with manufacturer's specification. Hanger wire shall support no greater than 16 square feet. Install additional hangars at ends of each suspension member, at each end of light fixtures, and 6 inches from vertical surfaces. Do not splay wires more than 5 inches in a 4 foot drop. Bottom of surfaces shall be flush and level. Miter corners where wall moldings intersect.
C. The plumbing and heating contractors shall not utilize hangers or framing of suspension system. The electrical contractor may utilize suspension system for lay-in fixture installation but shall furnish two supplementary hangers per fixture for maintaining maximum load deflection. Electrical contractor shall not utilize tile as sole support for any ceiling-mounted electrical device. All ceiling-mounted electrical devices shall be supported with brackets attached to tees.
D. Ceilings laid out as shown on the drawings, however, if not specifically shown, ceilings laid out from center of room in both directions so that cut tiles are equal at all edges. Place materials to have full bearing on suspension members.
E. Where there are cut edges at tegular tile, or other tile with profile below the grid, touch up cut edges as recommened by Manufacturer with Manufacturer's recommended touch-up paint. Where cut edges are next to a wall and will not be visible, touch up paint is not required. Do not apply touch-up paint on the face of ceiling tile.

3.02 INSPECTION

A. Following installation, soiled or discolored units cleaned to match adjacent perfect material. Any broken or damaged material which cannot be corrected by cleaning, removed and replaced with perfect material.

END OF SECTION 09 51 00

SECTION 09-6500 – RESILIENT FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide all resilient flooring materials with accessories as shown on the drawings and as herein specified.
B. Related Sections include the following:
   1. Division 9 Section “Carpet.”

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Materials delivered to job site in manufacturer's unopened containers with labels intact. Store materials at minimum temperature of 70°F in all areas for at least 48 hours prior to installation.

1.04 JOB CONDITIONS

A. Environmental Requirements: Maintain temperature of 70°F in all areas for at least 48 hours before, during and after installation. Maintain a temperature of 60°F after installation.

1.05 SUBMITTALS

A. Submit the following samples of each type, color, and pattern of resilient flooring and accessories required, showing full range of color and pattern variations.
   1. Full size tile samples
   2. 2-1/2' long samples of resilient flooring accessories.

1.06 QUALITY ASSURANCE

A. Tile, Mastic and all other materials shall be asbestos free.
B. Install resilient floor tiles in accordance with the recommended method of the "Tile Contractors Association of America Handbook".
C. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.07 EXTRA MATERIALS

A. Provide the following, for each color and type installed, for future replacement:
   1. Floor Tile: 5% in unopened boxes.
   2. Rubber Base: 10% of installed quantity.

3. Stair Treads: **10% of installed quantity.**
4. Transition Mouldings: provide as one single piece, or full length pieces as applicable.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Rubber Floor Tile: 5/32" thick homogeneous rubber tile, PVC free, with raised design.
   1. Basis of Design:
      a. Flexco, Distinct Designs, Radial II (RGT)
      b. Color: Stone, 024.
B. Rubber Stair Stringer: .080" thick rubber stringer 10"x72"
   1. Basis of Design:
      a. Flexco, Distinct Designs, Radial II, 10" Stringer
      b. Color: Stone, 024.
C. Transition and Reducers: Refer to drawings.
   1. Basis of Design Manufacturer: Flexco
D. Rubber Base:
   1. Basis of Design:
      a. Flexco, Captivate (4 ¼ inch)
      b. Color: Stone, 024.
E. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer. Concrete areas to receive sheet shall not have sealer or hardener applied.
F. Adhesive: Type recommended by material manufacturer for each specific product and for its area of use.
G. Leveling Compound: Latex type as specifically recommended by material manufacturer.
H. Floor Polish: Provide protective, liquid floor-polish products as recommended by the flooring manufacturer.
I. All materials best grade, with no second grade, off goods or remnants allowed.

PART 3 - EXECUTION

3.01 INSPECTION

A. All surfaces receiving resilient flooring material shall be examined by the installer for any defects which in his opinion, he considers detrimental to a proper installation. Concrete floors dry and free of dust and laitance. Any defects found during inspection must be corrected prior to installation; this includes any sanding, brushing or leveling required. Installation constitutes acceptance of substrate conditions.

3.02 PREPARATION

A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
B. Surface Preparation:
   1. General: Prepare floor substrate in accordance with manufacturer's instructions.
   2. Floor Substrate: Prepare floor substrate to be smooth, rigid, flat, level, permanently dry, clean and free of foreign materials such as dust, paint, grease, oils, solvent, curing and hardening compounds, sealers, asphalt and old adhesive residue.
   3. Concrete Floor Substrate: Concrete floor substrate shall have a minimum compressive strength of 3500 psi. Refer to Division 3 Concrete sections for patching and repairing crack materials, and leveling compounds with Portland cement based compounds. Do not use or install flooring over gypsum based leveling or patching materials
   4. Reference Standard: Comply with ASTM F 710 Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.

C. Concrete Moisture Test:
   1. ASTM F1869-98 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Sub floor Using Anhydrous Calcium Chloride: The moisture emission from the concrete shall not exceed 5.0 lbs. per 1000 sq. ft. in 24 hrs (verify using the calcium chloride test as per ASTM F 1869-98). A diagram of the area showing the location and results of each test shall be submitted to the Architect. If test results exceed limitations, the installation shall not proceed until the problem has been corrected.
   2. ASTM F2170-02 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes. The relative humidity measured from the center of the concrete slab should not exceed 75%. If the test results exceed the limitations, the installation must not proceed until the problem has been corrected.
   3. The test area shall be conditioned with the permanent HVAC system set at a uniform temperature of at least 68 degrees F (20 degrees C) for 72 hrs prior to and during testing.
D. Concrete pH Test: Perform pH tests on concrete floors regardless of the age or grade level. If the pH is greater than 10, it must be neutralized prior to beginning the installation.
E. Prohibit traffic until filler is cured.
F. Vacuum clean substrate.

3.03 INSTALLATION

A. Clean all surfaces of grease, dirt, paint and other objectionable matter. Fill and level any holes, cracks, joints and depressions in substrate with leveling material. Provide backer material if necessary.
B. Flooring and accessories installed in strict accordance with manufacturers printed instructions.
C. All rubber tile to be laid in basket weave pattern. Unless noted otherwise, floor tile shall be laid so that fields or patterns center on area to be tiled. No tiles will be less than half size.
D. Lay tiles with close joints, fit neatly into recesses and around abutting work. Tile cemented securely and solidly in place. Finished surfaces true in plane and flush throughout.
E. At places where flooring terminates, provide reducing edge strips.
F. At transitions between floor types provide appropriate molding accessory. Mouldings at corners shall be mitered.
G. Apply wall base to walls, casework/cabinets and other permanent fixtures in rooms or areas where base is required. Tightly bond continuous base to substrate with contact at horizontal and vertical surfaces.
H. At places where flooring abuts a vertical surface without cove base or at floor transitions tile shall be cut evenly and without a gap between the tile and adjacent surface.

3.04 PROTECTION AND CLEANING

A. Protect floors with un-dyed, untreated Kraft paper immediately after placement. Traffic should be kept off for at least 8 hours. No heavy equipment or scaffolding should be dragged over the floor.
B. Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with the manufacturer's instructions prior to the owner's acceptance. Remove construction debris from the project site and legally dispose of debris.
   1. Remove visible adhesives, scuff marks and other surface blemishes using cleaning methods recommended by the manufacturer.
   2. Do not wash floor until after time period recommended by the floor tile manufacturer.
   3. Damp mop tile flooring to remove markings and soil.
C. Rubber tile shall be cleaned and polished with manufacturer's recommended cleaner and given 2 coats of non-slip water emulsion polish in accordance with manufacturer's

recommendations. Upon completion, floor must present a clear polished finish with a glossy surface. Rubber base shall also be cleaned removing all adhesive or other defects.

END OF SECTION 09 65 00

SECTION 09-6519 – LUXURY VINYL TILE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Luxury Vinyl Tile (LVT) Flooring System.
B. Related Documents: The Contract Documents, as defined in Division 1 Section - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.
C. Related Sections: Related work specified elsewhere includes but may not be limited to
   1. Division 9 Section: Resilient Base.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM F710, Preparing Concrete Floors to receive resilient flooring
   2. ASTM 1914, Short term indention test
   3. ASTM 2055, Size and squareness of resilient flooring
   4. ASTM 2199, Dimensional stability and curing properties
   5. ASTM F1700, Solid vinyl specification

1.04 SUBMITTALS

A. Division 1 Section - Submittal Procedures: Procedures for submittals.
B. Product Data: Data describing physical and performance characteristics; including sizes, patterns and colors including manufacturer's product sheet.
C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors, patterns and textures.
D. Samples: Submit selection and verification samples for finishes, colors, and textures.
E. Quality Assurance Submittals: Submit the following:
   1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
   2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.
   3. Manufacturer's Instructions: Manufacturer's installation instructions.
F. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
   2. Warranty: Warranty documents specified herein.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of this Section with minimum 5 years documented experience.
   1. Engage installer certified, as a “manufacturer’s approved mechanic.”
   2. Certificate: When requested, submit certificate indicating qualification.
B. Regulatory Requirements:
   1. Critical Radiant Flux in Accordance with ASTM E 648: More than 0.45 Watts per square centimeter.
   2. Specific Optical Smoke Density in Accordance with ASTM E 662: Less than 450.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Division 1 Section - Product Requirements: Transport, Handle, Store, and Protect Products.
B. Ordering: Comply with manufacturer’s ordering instructions and lead time requirements to avoid construction delays.
C. Deliver tiles and installation accessories to site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, project identification, and shipping and handling instructions.
D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
   1. Material should be stored in areas that are fully enclosed, weathertight with the permanent HVAC system set at a uniform temperature of at least 68 degrees F (20 degrees C) for 72 hrs. prior to and during installation.
   2. Store tiles on flat surfaces.

1.07 PROJECT CONDITIONS OR SITE CONDITIONS

A. Jobsite Requirements:
   1. Environmental Requirements/Conditions: In accordance with manufacturer's recommendations, areas to receive flooring shall be clean, fully enclosed, weather tight with the permanent HVAC set at a uniform temperature of at least 68 degrees F. The flooring material should be conditioned in the same manner. Maximum temperature should not exceed 100 degrees F after installation.
   2. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during, and after installation as recommended by manufacturer.
   3. Temperature Conditions: 68 degrees F (20 degrees C) for 72 hours prior to, during and after installation.
   4. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.08 SEQUENCING AND SCHEDULING

A. Finishing Operations: Install tile flooring after finishing operations, including painting and ceiling operations, have been completed.
B. Concrete: Do not install tile flooring over concrete substrates until substrates have cured and are dry to bond with adhesive as determined by resilient flooring manufacturer's recommended bond, moisture test, and pH test.

1.09 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard Warranty document executed by authorized company official.
   1. Warranty Period: Ten (10) Year Limited Warranty, commencing on Date of Substantial Completion.

1.10 MAINTENANCE MATERIALS

A. Division 1 Section - Closeout Procedures and Training: Procedures for closeout submittals.
B. Extra Materials:
    1. Provide 3% (minimum one box) of extra floor tiles for each tile type, panel, and color.
    2. Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels.

PART 2 - PRODUCTS

2.01 MANUFACTURERS AND MATERIALS

A. Luxury Vinyl Tile: Subject to compliance with project requirements, manufacturers offering specified items which may be incorporated in the Work include the following:
    1. Basis of Design: Tarkett
        a. Product: Event+ Wood, Color: Seasonal Oak, 11209
        b. Installation: Unidirectional

2.02 ACCESSORIES

A. Underlayment:, as recommended by manufacturer.
B. Adhesives: Adhesive required for installation, as approved by flooring manufacturer for specific material and substrates encountered.
C. Subfloor Filler: Use of Portland-based patching compound modified with latex with a minimum 3,500 psi to smooth or level imperfections, as recommended by the manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Division 1 Section - Execution: Verification of existing conditions before starting work.
B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required and ready to receive Work and are acceptable for product installation in accordance with manufacturer’s instructions.
C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.
E. Material Inspection: In accordance with manufacturer's installation requirements, visually inspect materials prior to installation. Material with visual defects shall not be installed and shall not be considered as a legitimate claim.

3.02 PREPARATION

A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
B. Surface Preparation:
    1. General: Prepare floor substrate in accordance with manufacturer's instructions.
    2. Floor Substrate: Prepare floor substrate to be smooth, rigid, flat, level, permanently dry, clean and free of foreign materials such as dust, paint, grease, oils, solvent, curing and hardening compounds, sealers, asphalt and old adhesive residue.
    3. Concrete Floor Substrate: Concrete floor substrate shall have a minimum compressive strength of 3500 psi. Refer to Division 3 Concrete sections for patching and repairing crack materials, and leveling compounds with Portland cement based compounds. Do not use or install flooring over gypsum based leveling or patching materials

4. Reference Standard: Comply with ASTM F 710 Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.

C. Concrete Moisture Test:
   1. ASTM F1869-98 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Sub floor Using Anhydrous Calcium Chloride: The moisture emission from the concrete shall not exceed 5.0 lbs. per 1000 sq. ft. in 24 hrs (verify using the calcium chloride test as per ASTM F 1869-98). A diagram of the area showing the location and results of each test shall be submitted to the Architect. If test results exceed limitations, the installation shall not proceed until the problem has been corrected.
   2. ASTM F2170-02 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes. The relative humidity measured from the center of the concrete slab should not exceed 75%. If the test results exceed the limitations, the installation must not proceed until the problem has been corrected.
   3. The test area shall be conditioned with the permanent HVAC system set at a uniform temperature of at least 68 degrees F (20 degrees C) for 72 hrs prior to and during testing.
D. Concrete pH Test: Perform pH tests on concrete floors regardless of the age or grade level. If the pH is greater than 10, it must be neutralized prior to beginning the installation.
E. Prohibit traffic until filler is cured.
F. Vacuum clean substrate.

3.03 INSTALLATION - TILE FLOORING

A. Install LVT flooring in accordance with manufacturer's published instructions.
   1. Installation environment should be conditioned to a constant temperature and humidity conditions. Site should have permanent windows and doors, fully enclosed, weather tight with permanent HVAC system (not temporary) set at a uniform temperature of at least 65 degrees F (20 degrees C) for 72 hours prior to, during, and 72 hours after installation.
B. Open number of floor tile cartons to provide quantity of flooring material required to cover each area; mix tile pieces to ensure shade variations do not occur within any one area.
C. Spread only enough adhesive to permit installation of floor materials before initial set.
D. Set flooring in place, press with a 150 pound resilient flooring roller to attain full adhesion.
E. Lay flooring from center marks established parallel to building walls.
   1. Allow minimum 1/2 full size tile width at room or area perimeter.
   2. Adjust tile layout as required to avoid use of units less than 1/2 tile.
F. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar. Where flooring continues through door opening, continue established pattern with no interruption.
G. Install edge strips at unprotected or exposed edges where flooring terminates.
   1. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
H. Extend flooring into toe spaces, door reveals, closets, and similar openings.
I. Adhere flooring to substrate without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed flooring installation.
   1. Use adhesive applied to substrate in compliance with flooring manufacturer’s recommendations, including those for trowel notching, adhesive mixing, and adhesive open and working times.
J. Wait at least 5 days after installation before conducting wet cleaning.

3.04 INSTALLATION - BASE

A. Install wall base in accordance with manufacturer's published instructions.
B. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.
C. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
   1. Install wall base on solid backing. Bond tight to wall and floor surfaces.
D. Apply the base to the cabinet toe kicks. If necessary, use a hot air gun to make the base pliable enough to turn the corners of the toe kick. Minimize or eliminate base seams on the toe kick. If the

cabinet butts into a wall, start the base where the wall and cabinet meet and continue around the exposed area of the toe kick.

3.05 SITE ENVIRONMENTAL PROCEDURES

A. Indoor Air Quality:
   1. Temporary ventilation: As specified in Division 1 Section - Environmental Procedures.
      a. Ventilate products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of minimum 60 degrees F to maximum 90 degree F continuously for minimum 72 hours. Do not ventilate within limits of Work unless otherwise approved by Owner.

3.06 FIELD QUALITY CONTROL

A. Division 1 Section - Quality Requirements: Field inspection.
   1. Manufacturer's Field Services: Upon Owner's request and with at least 2-3 week notice, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.
B. Inspect flooring and base installation, pattern, layout, and attachment to substrate.

3.07 CLEANING

A. Division 1 Section - Execution: Cleaning installed Work.
B. Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
   1. Remove visible adhesive and other surface blemishes using cleaning methods recommended by tile floor manufacturer.
   2. Do not wash floor until after time period recommended by tile flooring manufacturer.
   3. Damp mop tile flooring to remove black marks and soil.

3.08 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

END OF SECTION 09 65 19

SECTION 09-6566 – ATHLETIC RUBBER FLOORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 DESCRIPTION

A. Scope:
   1. The complete installation of resilient athletic rubber sports flooring.
   2. Accessories for installation, maintenance and repair.
B. Related Specifications
   1. Division 3 Section “Concrete.”

1.03 QUALITY ASSURANCE

A. Floor System Manufacturer Qualifications
   1. Manufacturer shall be an established firm experienced in field and have been in business for a minimum of ten (10) years.
B. Floor Contractor/Installer Qualifications
   1. Flooring contractor shall be experienced in the flooring field.
   2. Flooring contractor shall be factory-approved and have completed at least three projects of similar magnitude and complexity.
C. Provide mock-up of 6’ x 6’ minimum, to be evaluated by Architect prior to proceeding.

1.04 SUBMITTALS

A. Submit samples of the actual sport surface in the standard colors.
B. Submit three copies of each of the following:
   1. Manufacturer’s requirements for correct preparation, finishing and testing of substrate base material to receive premanufactured rubber sport surface.
   2. Adhesive product data sheets and manufacturers certificates indicating approval for the proposed application.
   3. Interior and exterior line paint data sheets and manufacturers certificates indicating approval for the proposed application.
   4. Manufacturer's standard warranty.
   5. Manufacturer's installation and maintenance instructions.
C. Shop Drawings: provide shop drawings prepared for the specific project illustrating layouts, details, dimensions and other data.

1.05 MAINTENANCE MATERIALS

A. Provide extra stock materials from original dye lots, for use in facility operations and maintenance (approximately 2% of the total floor surface for each color, surface texture and format of Manufactured Product).

1.06 DELIVERY AND STORAGE

A. Delivery of Materials

1. Material shall not be delivered or installed until all masonry, painting, plastering, tile work, marble and terrazzo work are completed, and all overhead mechanical work, lighting, backstops, scoreboards are installed. Room temperature of at least 55 degrees Fahrenheit and moisture content of concrete slab of 3% or less.
2. Products Supplied must be delivered in Manufacturer's original, unopened and undamaged packaging with identification labels intact.

B. Storage:
1. Area where materials are to be stored should be maintained at 55 degrees Fahrenheit and under 50% relative humidity by the General Contractor.
2. Products Supplied must be protected from exposure to harmful weather conditions and must be safely stored on a clean, dry, flat surface. Store rolls of resilient athletic flooring upright; store tiles of resilient athletic flooring on a flat surface, carefully protecting corners and edges.
3. Avoid storing Manufactured Product for extended periods of time or additional material trimming may be required.
4. Do not install product damage during handling (i.e. dents/scratches, edge chipping, excessive warping, etc.).

1.07 JOB CONDITIONS

A. Concrete subfloors, on or below grade, must be installed over a permanent effective vapor retarder, respecting current versions of the standard practice ASTM E1643 and the standard specification ASTM E1745. The vapor retarder must be placed directly underneath the concrete slab, above the granular fill, as per Manufacturer's instructions. The vapor retarder must have a perm rating of 0.1 or less and must have a minimum thickness of 10 mil (0.010in).

B. No concrete sealers or curing compounds are applied or mixed with the subfloors (refer to Section 03 05 00 – Common Work Results for Concrete of Division 3).

C. Installation of the resilient athletic flooring to be carried out no sooner than the specified curing time of concrete subfloor (normal density concrete curing time is approximately 28 days for development of design strength). Refer to current version of ASTM F710.

D. The subfloor surface must be free of any paint, wax, oil, grease, sealer, curing compound, solvent or any other contaminants that may inhibit bond. All contaminants must be removed from the surface via mechanical abatement. Use of abatement chemicals is not recommended.

E. Concrete to have smooth, dense finish, and be highly compacted with a tolerance of 1/8'' in a 10ft radius (3.2mm in 3.05m radius). Floor Flatness (FF) and Floor Levelness (FL) numbers are not recognized.

F. Moisture and alkalinity tests must be performed on all concrete substrates, under in-service conditions. It is recommended to turn on the HVAC unit prior to performing moisture testing, in order to ensure stable testing conditions and accurate results. The concrete's surface pH should be between 7 and 10. Relative humidity of the concrete slab must not exceed 85%, in accordance with ASTM F2170 (in situ probes). Moisture vapor emissions from the concrete slab must not exceed the tolerance of the adhesive specified, in accordance with ASTM F1869 (anhydrous calcium chloride).

G. Maintain a stable room and subfloor temperature within the recommended range of 65oF to 86oF (18oC to 30oC), 48 hours prior to installation, during the installation, and 48 hours after the installation. Recommended ambient humidity control level is between 35 to 55%.

H. Installation of resilient athletic flooring will not commence until the building is enclosed and all other trades have completed their work. It is the General Contractor or Construction Manager's responsibility to maintain a secure and clean working area before, during and after the installation of the resilient athletic flooring.

1.08 WARRANTY

A. The resilient athletic flooring is warranted to be free from manufacturing defects for a period of one (1) year from the date of shipment from the Manufacturer.

B. The resilient athletic flooring shall be warranted against excessive wear under normal usage for a period of ten (10) years from the date of shipment from the Manufacturer.

PART 2 - PRODUCTS

2.01 ATHLETIC RUBBER FLOORING

A. Vulcanized composition rubber athletic floor rolls
   1. Basis of Design:
      a. EcoSurfaces – ECOfit rolls 3.2mm wear layer and 5mm backing.
         1) Color: 1216 Final Cut
      b. Contact:
         1) 715 Fountain Avenue, Lancaster, PA, 17601
         2) 833-888-1760

2.02 MISCELLANEOUS MATERIALS

A. Trowel able Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips: Metal edge strips, in sizes to match rubber flooring thickness and adjacent finish materials at transitions. Subject to compliance with requirements, provide metal strips.
   1. Rubber floor to Concrete, VCT, or other lower floor material: Ramp at door threshold in compliance with TAS 2012. Finish: Stainless steel.

2.03 ADHESIVE

A. Rubber sport surface adhesive to be two part polyurethane or epoxy adhesive suitable for adherence of a goods to concrete substrate. Adhesive to be supplied by the surface manufacture.

PART 3 - EXECUTION

3.01 GENERAL

A. Ensure that concrete subfloors, on or below grade, are installed over a permanent effective vapor retarder, respecting current versions of the standard practice ASTM E1643 and the standard specification ASTM E1745. The vapor retarder must be placed directly underneath the concrete slab, above the granular fill, as per Manufacturer's instructions. The vapor retarder must have a perm rating of 0.1 or less and must have a minimum thickness of 10 mil (0.010in).

B. Installation of the resilient athletic flooring to be carried out no sooner than the specified curing time of concrete subfloor (normal density concrete curing time is approximately 28 days for development of design strength). Refer to current version of ASTM F710.

C. Ensure that no concrete sealers or curing compounds have been applied to or mixed into the concrete (refer to Section 03 05 00 – Common Work Results for Concrete of Division 3).

D. Subfloor surface must be free of any paint, wax, oil, grease, sealer, curing compound, solvent or any other contaminants that may inhibit bond. All contaminants must be removed from the surface via mechanical abatement. Use of abatement chemicals is not recommended.

E. Confirm concrete has smooth, dense finish, and is highly compacted with a tolerance of 1/8'' in a 10ft radius (3.2mm in 3.05m radius). Floor Flatness (FF) and Floor Levelness (FL) numbers are not recognized.

F. All inserts, penetrations and other construction items which affect the installation of the prefabricated rubber sport surface to be in place.

G. Moisture and alkalinity tests must be performed on all concrete substrates, under in-service conditions. It is recommended to turn on the HVAC unit prior to performing moisture testing, in order to ensure stable testing conditions and accurate results. The concrete's surface pH should be between 7 and 10. Relative humidity of the concrete slab must not exceed 85%, in accordance with ASTM F2170 (in situ probes). Moisture vapor emissions from the concrete slab

must not exceed the tolerance of the adhesive specified, in accordance with ASTM F1869 (anhydrous calcium chloride).

H. Maintain a stable room and subfloor temperature within the recommended range of 65oF to 86oF (18oC to 30oC), 48 hours prior to installation, during the installation, and 48 hours after the installation. Recommended ambient humidity control level is between 35 to 55%.

I. Installation of resilient athletic flooring will not commence until the building is enclosed and all other trades have completed their work. Ensure a secure and clean working area before, during and after the installation of the resilient athletic flooring. Rubber sports surface installer to approve field conditions.

J. Deficiencies in substrate to be corrected prior to installation.

3.02 INSTALLATION

A. Install prefabricated rubber sports surface in accordance with the latest manufacturer's recommendations. Installation by a manufacturer certified contractor.

B. Hold all seams in place with suitable weights for a minimum of 12 hours and precisely fit prior to adhesion.

C. Product should be unrolled and allowed to relax before cutting and fitting, 12 to 24 hours.

D. Mix two-component polyurethane adhesive according to manufacturer’s instructions. Adhesive to be spread with an 1/8 or 1/6″ notched trowel.

E. Unroll product into freshly applied adhesive. End seams should be overlapped and double cut. Edge seams should be factory edge. Overlap seams 1/8” and compression fit.

F. Roll the entire sport floor surface with a medium-size steel roller to remove entrapped air.

G. Wipe away adhesive that oozes between seams with wood alcohol.

H. Install rubber base, anchored to walls with base cement.

I. Clean up all unused materials and debris and remove same from the premises. Dispose of empty containers in accordance with federal and local statutes.

END OF SECTION 09 65 66

SECTION 09-6813 – TILE CARPETING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Perform all work required to complete the Carpeting indicated by the Contract Documents and all work that can be reasonably inferred to be included. Furnish all supplementary items necessary for its proper installation.
B. Related Sections include the following:
   1. Division 09 Section “Resilient Base and Accessories”, for rubber base.
   2. Division 09, floor finish Sections, for transition with adjacent flooring systems not covered in this Section.

1.03 SUBMITTALS

A. Submit to architect and/or owner ten (10) days prior to bid, two (2) 12" x 12" finished samples of the exact type of carpet proposed, including quality, pattern, color, and backing.
B. Submit to architect and/or owner ten (10) days before bid, any proposed substitutions for consideration. Submit at least three (3) references of installations, that have been in use for two (2) years or more using the same backing technology of all carpets, as described within this text. Include contact names and telephone numbers.
C. Submit manufacturer's warranties, installation instructions, and maintenance instructions before bid date.
D. Submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests as well as the test listed under 1.04 F.
E. Submit to architect and/or owner ten (10) days prior to bid, the manufacturers plan for recycling the specified carpet and related items at the end of the useful life of the carpet.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver all materials to the project properly protected taking care not to damage any materials.

1.05 JOB CONDITIONS

A. Deliver all materials to the installation site in the manufacturer's original packaging and in good condition. Packaging to contain manufacturer's name and marks, identification number, shipping and handling instructions and related information.

B. Delivered and stored materials must be available for inspection as required by the owner, architect, general contractor, and/or the manufacturer.

C. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document.
D. Sub-floor preparation will include, as required, the removal and repair of the existing floor surface. It is required that the floor of a renovation project be inspected before the bid date.
E. All materials, including adhesives, are to be delivered to the site of installation at a minimum of 48 hours prior to the start of installation and stored in a clean and dry room that measures above 65°F and below 95°F and measures between 10% and 65% relative humidity (RH). To maintain temperature and relative humidity, permanent heating and air conditioning systems (HVAC) must be in operation. Stack rolls horizontally and no higher than two rolls high on a flat surface. After work is completed, the ambient room temperature should remain at 65°F and relative humidity between 10% and 65% for 48 hours. These materials and related adhesives shall be protected from the direct flow of heat from heating fixtures and appliances such as hot-air registers, radiators, or other. Site conditions shall include those specified in the carpet manufacturer' installation manual and shall also include sufficient heat, light, and power required for effective and efficient working condition.
F. Once the temperature and relative humidity in area for installation have been stabilized, loose lay the carpet within the installation area and allow it to precondition for 48 hours prior to installation. Carpet installation shall not commence until painting and finishing work is complete and ceiling and overhead work is tested, approved, and completed. Traffic shall be closed during the installation of the flooring products. Verify concrete slabs are dry per the standards for bond and moisture tests listed in the manufacturer's installation manual.

1.06 QUALITY ASSURANCE AND REGULATORY REQUIREMENTS

A. Qualifications of Installers: All work shall be done by installation firms specializing in commercial carpet installation. It is required, that the firm or individual shall be a member of the Floor Covering Installation Contractors Association (FCICA) and/or certified by the Certified Floorcovering Installers Association (CFI). Flooring contractor to be specialty contractor normally engaged in this type of work and shall have three (3) years minimum documented experience in commercial installation of these materials and participation in manufacturer's environmental program including responsible carpet removal, recycling, and installation.
B. Flooring contractor will be responsible for the proper product installation, including floor preparation in all the areas indicated in the drawings to receive carpet. The carpet installation standard will be as listed in The Carpet and Rug Institute's Standard for Installation of Commercial Carpet CRI-104, the standard that establishes the minimum installation procedures.
C. Flooring contractor to provide owner a written warranty that guarantees the completed installation to be free from defects in materials and workmanship for a period of no less than two (2) years after job completion.
D. All warranties must be issued by the manufacturer as standard published warranties on all types of carpet within this document. Second source warranties that involve parties other than the carpet manufacturer are unacceptable. The carpet manufacturer will provide standard published written performance warranties for the following:
    1. Lifetime warranty against excessive surface wear. Excessive wear means no more than 10% loss of pile fiber weight measured before and after use as tested under ASTM D-3936.
    2. Lifetime static protection, meaning built-in protection below 3.0 kv as tested under AATCC-134.
    3. Tuft Bind (edge ravel, yarn pulls, zippering)
    4. Delamination
    5. Lifetime Moisture Barrier
    6. Lifetime Dimensional Stability (for modular products only)
E. Carpet manufacturer to provide field service experts to assist in project start-up as required by the job. Manufacturer will notify owner, architect, general contractor, or another designated contact if any installation instructions are not followed.

F. Provide flooring material to meet the following test performance criteria as tested by a recognized independent testing laboratory. Certified test reports shall be submitted by the carpet manufacturer for each test method. Requirements listed below must be met by all products being submitted for approval:
   1. Pill Test / DOC-FF-1-70 (ASTM D-2859) - Requirement: Pass
   2. Flooring Radiant Panel / ASTM E-648 - Requirement: Class I (Above .45 w/cm)
   3. CRI VOC Chamber Test/Indoor Air Quality test (CRI-IAQ) Green Label Plus Test.
   4. Lightfastness: Rating of not less than 5 on International Grey Scale after 40 SFU's when tested in accordance with AATCC Test Method 16E.
   5. Crockfastness: Minimum stain rating on International Grey Scale of not less than 5 wet or dry when tested in accordance with AATCC Test Method 165.
   6. Atmospheric Fading: Burned Gas shall not be less than 5 on International Grey Scale after two cycles on each test as per AATCC Test Method 129 Ozone and AATCC Test Method 23.

G. Waste Reduction: If applicable, all polyethylene roll wrap shall be collected and recycled and all cardboard be collected and recycled.

1.07 WARRANTY

A. Manufacturer’s standard form, limited lifetime commercial warranty.

1.08 EXTRA MATERIALS

A. Provide 10% of installed quantity as attic stock for future replacement, of each color and pattern indicated.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The following products/manufacturers are acceptable:
   As scheduled in the Drawings.

2.02 MATERIAL

A. Carpet: Provide material of construction, material, weight, and aesthetic and other properties and performance factors equal to or exceeding scheduled products, as approved by Architect, and as follows.
   1. Carpet Tile Type 1:
      a. Product: Edge Edit manufactured by Tarkett
      b. Color: Armor 22402
      c. Backing: Ethos Modular
      d. Construction: Patterned Loop
      e. Dye Method: 100% Solution Dyed
      f. Fiber System: Dynex SD Nylon (Permanent Stain Resistance)
      g. Face Weight: 14 oz./sy.
      h. Pile Density: 6072 oz./y3.
      i. Gauge: 5/64
      j. Stitches: 10 stitches/in
      k. Standard Size: 24" x 24" approx.

2.03 ADHESIVES

A. Adhesive recommended by manufacturer for installation of carpet and backing specified.

2.04 ACCESSORIES

A. Provide transition/reducing strips tapered to meet abutting materials as indicated in the drawings.
B. Provide edge strips made of extruded aluminum with a mill finish, unless otherwise noted.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine and verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet.
B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet.
C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
D. Verify that concrete sub-floor surfaces are dry enough and ready for flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by carpet manufacturer and adhesive materials manufacturer.
E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Starting installation constitutes acceptance of sub-floor conditions.
B. SURFACE PREPARATION- Dust, dirt, debris and noncompatible adhesive must be removed before the installation begins. Surfaces must be smooth and level with all holes and cracks filled with Portland cement-based patch reinforced with polymers or primed with sealer recommended by manufacturer.
C. CONCRETE MOISTURE TESTING and pH Testing - Substrate surfaces must be tested for moisture emission. It is the responsibility of the owner or owner's representative to perform moisture testing prior to starting the installation. ASTM-F2170-2 relative humidity probe moisture testing or ASTM-F1869 calcium chloride testing can be performed on the concrete to determine the surface moisture emission rate. Acceptable relative humidity probe testing results are up to 90% RH. An acceptable result for calcium chloride moisture testing is up to 5 lbs per 1,000 SF per 24 hours. Alkalinity tests should also be performed per ASTM-F710. The maximum acceptable pH is 9.0. Carpet prefers relative humidity probe moisture testing over calcium chloride testing, as the results are more accurate and reliable. For test results that determine RH test readings of 90%-97%, moisture emission rates of 5 lbs - 8 lbs, or pH readings of 9.0 - 11.00, Sealer recommended by manufacturer is required.
D. SUBFLOORS
    1. New Concrete - New concrete must be fully cured and free of moisture. New concrete requires a curing period of approximately 90 days.
    2. Wood - Wood floors must be smooth and level. If the floor is uneven, an approved underlayment will be required. Old finishes must be tested for compatibility with adhesives or removed and porous wood primed with sealer recommended by manufacturer.

3.03 INSTALLATION OF FLOORING

A. Install flooring in strict accordance with the finish drawings, manufacturer's instructions, and CRI Carpet Installation Standard. Install carpet tile in accordance with manufacturer's instructions and CRI 104.
B. ADHESIVE SYSTEM- install adhesive to meet manufacturer’s recommendations and requirements for backing system.
C. TILE PLACEMENT - Arrows are embossed or printed on the module backing to show pile direction. To ensure proper alignment, check spacing every ten modules. Measure ten

modules; proper spacing should be within ¼ inch. Continue to check spacing every ten modules throughout the entire installation.

D. PALLET AND BUNDLE SEQUENCING - It is very important to install carpet modules in the order they were manufactured; this is easily accomplished by selecting pallets in sequential order and following the numbers located on each bundle. Typically, an installation will begin with the lowest bundle numbers and progress through the highest numbers until the project is complete. Installing modules by bundle sequence will assure the most even uniform look possible.
E. FLATWIRE CABLE / TRENCH HEADERS - Cable should be centered under modules and no adhesive used unless approved by the manufacturer. Trench headers require a control grid of adhesive on either side of header panels to prevent movement. It is highly recommended that these areas be installed ashlar.
F. FINISHED INSTALLATION- Roll entire job with 75-100 lb. roller after completion of installation.

3.04 CLEAN-UP

A. After carpet installation is complete, remove all remnants, wrapping paper and debris. Neatly trim all sprouting tufts with sharp scissors. The Owner shall view all carpet scraps and retain any as designated for future repairs, before they are removed from the job site. These scraps shall be in addition to attic stock or maintenance material specified.
B. All carpet shall be vacuumed and left protected in a manner ready for occupancy.

END OF SECTION 09 68 13

SECTION 09-8100 – ACOUSTICAL INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide sound insulation as shown on the drawings and as herein specified.
B. Related Sections include the following:
   1. Division 07 Section “Thermal Insulation.”
   2. Division 07 Section “Joint Sealants”, and Division 09 “Gypsum Board Assemblies”, for acoustical sealants and other acoustical components used in partition wall assemblies.
   3. Division 08 Section “Metal Frames”, for acoustical treatment inside metal door and window frames.

1.03 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
B. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency
   1. Batt Insulation: flame spread and smoke developed of 0. NFPA 101 Class A.
   2. Other insulation types: As indicated.
C. Low VOC: All batt insulation products shall be made with binder containing no added urea formaldehyde.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original packages, clearly marked with brand name, type and R-Value.
B. Store materials in area protected from weather, moisture and damage, remove any damaged materials from the site.

1.05 SUBMITTALS

A. Samples of materials and complete product and technical description submitted for approval to the Architect prior to ordering materials.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Sound-Attenuation Blankets: ASTM C 665, Type I blankets without membrane facing produced by combining thermosetting resins with mineral fibers manufactured from slag wool, or rock wool. Unfaced batt insulation, 3-1/2” thick, with an R-Value of 15.
   1. STC-Rated Acoustical Assemblies: Comply with acoustical rating assembly requirements of partition, see drawings..
   2. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

B. Sound Insulation Blankets: BOD product – Sound Attenuation Batt by Owens Corning, without membrane facing, produced fiberglass strands.
   1. STC-Rated Acoustical Assemblies: Comply with acoustical rating assembly requirements of partition, see drawin.
   2. Fire-Resistance-Rated Assemblies: Non-combustible un faced batts 10/10 when tested according to ASTM E84.
   3. Provide resilient channels when indicated or required to meet required STC level.

C. Sound Insulation Batts above Lay-In Ceilings 3-1/2", unfaced batt insulation with an R-Value of 15, of same type as wall batts.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas receiving insulation work to insure work of preceding trades is completed. Check surfaces to see that they are uniform in place, free from mortar droppings, grease, oil or other debris which would affect proper insulation. Application constitutes acceptance of substrate conditions.

3.02 INSTALLATION

A. Insulation installed in accordance with current printed recommendations of insulation manufacturer.

B. Install sound batts tightly to studs and to all penetrations. Install tightly fitted and continuously behind and around conduit, boxes, pipe, and other obstructions. Install in full length pieces in each stud cavity to the extent possible to minimize the number of joints at cut ends. Fit cut ends pressed together to ensure a continuous acoustical barrier. Where the stud depth is greater than the nominal batt thickness, cut ends in mats shall be overlapped at least two inches.

END OF SECTION 09 81 00

SECTION 09-9100 – PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Provide complete surface preparation, priming, field painting and sealing of exposed exterior and interior items and surfaces.
    1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
    2. Examine specifications for various other trades and their provisions regarding their painting. Surfaces that are left unfinished by other sections of specifications shall be painted or finished as a part of this section.
B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
    1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
C. Do not paint prefinished items and finished metal surfaces except where otherwise noted in Drawings or specifications. Do not paint concealed surfaces, operating parts, and labels.
    1. Prefinished items include the following factory-finished components:
        a. Architectural woodwork.
        b. Acoustical wall panels.
        c. Toilet enclosures.
        d. Metal lockers.
        e. Elevator entrance doors and frames.
        f. Elevator equipment.
        g. Finished mechanical and electrical equipment.
        h. Light fixtures.
        i. Zinc wall panels
        j. Prefinished wall, roof & soffit panels
    2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
        a. Foundation spaces.
        b. Furred areas.
        c. Ceiling plenums.
        d. Pipe spaces.
        e. Duct shafts.
        f. Elevator shafts.
    3. Finished metal surfaces include the following:
        a. Anodized aluminum.

b. Stainless steel.
c. Chromium plate.
d. Copper and copper alloys.
e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:
   a. Valve and damper operators.
   b. Linkages.
   c. Sensing devices.
   d. Motor and fan shafts.
5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:
1. Division 5 Section "Structural Steel" for shop priming structural steel.
2. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
3. Division 6 Section "Architectural Woodwork" for shop priming interior architectural woodwork.
4. Division 7 Section "Joint Sealers ".
5. Division 8 Section "Wood Doors ".
6. Division 8 Section "Steel Doors and Frames" for factory priming steel doors and frames.
7. Division 8 Section "Wood Window & Door Restoration".
8. Division 9 Section "Plaster ".
9. Division 9 Section "Gypsum Board" for surface preparation of gypsum board.
10. Division 9 Section "Stage Flooring" for surface preparation of flooring.
11. Division 32 Section "Pavement Accessories" for traffic-marking paint.

1.03 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.04 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.
1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
3. Submit 3 samples on the following substrates for Architect's review of color and texture only:

a. Masonry: 6-by-10-inch samples of masonry, with mortar joint in the center, for each finish and color. (Field installation acceptable).
b. Painted Gypsum Board: 8-inch-square samples for each color and material on hardboard.
c. Stained or Natural Wood: 6-by-10-inch samples of natural- or stained-wood finish on representative Medium Red Oak surfaces.
d. Ferrous Metal: 4-inch- square samples of flat metal and 8-inch-long Samples of solid metal for each color and finish. (Field installation acceptable).
e. Plaster: 10-inch-square samples for each color. (Field installation acceptable).

C. Qualification Data: For Applicator.
D. The Contractor shall furnish the Owner with a booklet of actual samples of the colors used on the project at project completion.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
    1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
        a. Wall Surfaces: Provide samples on at least 100 sq. ft.
        b. Small Areas and Items: Architect will designate items or areas required.
        c. Portion of all wood to be finished or restored, including windows, doors, frames, rails, etc.
    2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
        a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
    3. Final approval of colors will be from benchmark samples.
D. Wood Sealer: Shall meet Fed. Spec. TT-W-572B for water repellence.
E. Materials shall be manufacturer's best grade of respective paint types.
F. Gloss levels for paints required are as per the National Paint and Coatings Association.
G. Prior to acid-etching of the concrete floor and application of the epoxy coating, an on-site conference of the applicator, contractor, Architect and manufacturer's representative shall review proper installation procedures.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
    1. Product name or title of material.
    2. Product description (generic classification or binder type).
    3. Manufacturer's stock number and date of manufacture.
    4. Contents by volume, for pigment and vehicle constituents.
    5. Thinning instructions.
    6. Application instructions.
    7. Color name and number.
    8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at an ambient temperature between 45 and 95 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
   1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.07 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
   1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.
D. Provide adequate ventilation of spaces while applying primer and finish coats.
E. All application of coatings shall be done under adequate illumination.

1.08 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
   1. Quantity: Furnish Owner with an additional 3 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.
C. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
   1. Benjamin Moore & Co. (Benjamin Moore).
   2. Coronado Paint Company (Coronado).
   3. ICI Dulux Paint Centers (ICI Dulux Paints).
   4. Kelly-Moore Paint Co. (Kelly-Moore).
   5. PPG Industries, Inc. (Pittsburgh Paints).
   6. Sherwin-Williams Co. (Sherwin-Williams).

2.02 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application

indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Match Architect's samples.

D. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.03 CONCRETE UNIT MASONRY BLOCK FILLERS

A. Concrete Unit Masonry Block Filler: Factory-formulated high-performance latex block fillers.

1. Benjamin Moore; Moorcraft Super Craft Latex Block Filler No. 285: Applied at a dry film thickness of not less than 8.1 mils.
2. Benjamin Moore; Moore's IMC Latex Block Filler No. M88: Applied at a dry film thickness of not less than 8.1 mils.
3. Coronado; 946-11 Super Kote 5000 Commercial Latex Block Filler: Applied at a dry film thickness of not less than 8.4 mils.
4. ICI Dulux Paints; Bloxfil 4000-1000 Interior/Exterior Heavy Duty Acrylic Block Filler: Applied at a dry film thickness of not less than 7.0 to 14.5 mils.
5. Kelly-Moore; 521 Fill and Prime Acrylic Block Filler: Applied at a dry film thickness of not less than 10.0 mils.
6. Pittsburgh Paints; 6-7 SpeedHide Interior/Exterior Masonry Latex Block Filler: Applied at a dry film thickness of not less than 6.0 to 12.5 mils.
7. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils.

2.04 EXTERIOR PRIMERS

A. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.

1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils.
2. Coronado; 35-147 Rust Scat Alkyd Metal Primer: Applied at a dry film thickness of not less than 2.0 mils.
3. ICI Dulux Paints; 4160-XXXX Devguard Multi-Purpose Tank & Structural Primer. Applied at a dry film thickness of not less than 2.0 mils.
4. Kelly-Moore; 1711 Kel-Guard Alkyd White Rust Inhibitive Primer: Applied at a dry film thickness of not less than 2.0 mils.
5. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
6. Sherwin-Williams; Pro-Cryl Universal Primer B66-310 Series: Applied at a dry film thickness of not less than 3.0 mils.

B. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils.
2. Coronado; 36-11 Rust Scat Latex Metal Primer: Applied at a dry film thickness of not less than 1.4 mils.
3. ICI Dulux Paints; 4160-XXXX Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils.

4. Kelly-Moore; 5725 DTM-Acrylic Metal Primer: Applied at a dry film thickness of not less than 1.8 mils. Where recommended by manufacturer.
5. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
6. Sherwin-Williams; Pro-Cryl Universal Primer B66-310 Series: Applied at a dry film thickness of not less than 3.0 mils.

C. Exterior Primer for existing ceramic coated sheet metal: Sherwin-Williams B51- 450 Interior/Exterior Multi-Purpose Latex "Adhesion Primer", or approved equal. Applied at a dry film thickness of 1.4 mils.
   1. Adhesion Primer must be topcoated within 14 days of primer application.

D. Exterior Primer for Wood without knots: Sherwin-Williams Exterior Latex Wood Primer B42W8041. Applied at dry film thickness of not less than 1.4 mils.

E. Exterior Primer for Wood containing knots: Sherwin-Williams Exterior Oil-Based Wood Primer Y24W8020. Applied at at dry film thickness of not less than 2.3 mils.

F. Exterior Primer for Concrete and Fiber Cement Siding (Hardi Board): Loxon Concrete & Masonry Primer B24W8300: Applied at a dry film thickness of not less than 3.0 mils.

G. Exterior Primer for Drywall: Sherwin-Williams B51- 450 Interior/Exterior Multi-Purpose Latex "Adhesion Primer", or approved equal. Applied at a dry film thickness of 1.4 mils.

H. Exterior Architectural PVC, Plastic, or Fiberglass: Sherwin-Williams B51- 450 Interior/Exterior Multi-Purpose Latex "Adhesion Primer", or approved equal. Applied at a dry film thickness of 1.4 mils.

2.05 INTERIOR PRIMERS

A. Interior Concrete Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.
   1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils.
   2. Coronado; 40-11 Super Kote 5000 Latex Primer-Sealer: Applied at a dry film thickness of not less than 1.2 mils.
   3. ICI Dulux Paints; 3030-1200 Bond-Prep Interior/Exterior Waterborne Pigmented Bonding Primer: Applied at a dry film thickness of not less than 1.8 mils.
   4. Kelly-Moore; 971 Acry-Prime Interior Latex Primer/Sealer: Applied at a dry film thickness of not less than 1.6 mils.
   5. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil.
   6. Sherwin-Williams; Loxon Concrete & Masonry Primer B24W8300: Applied at a dry film thickness of not less than 3.0 mils.

B. Interior Masonry Primer: 100% acrylic-emulsion conditioner for interior application only, to bond light chalk to the surface of existing brick & CMU.
   1. Sherwin-Williams; Loxon Conditioner Masonry Primer A24-1100 Series: Applied at a dry film thickness per manufacturer's recommendation.
   2. No substitutions

C. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
   1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils.
   2. Coronado; 40-11 Super Kote 5000 Latex Primer-Sealer: Applied at a dry film thickness of not less than 1.2 mils.
   3. ICI Dulux Paints; 1000-1200 Dulux Ultra Basecoat Interior Latex Wall Primer: Applied at a dry film thickness of not less than 1.2 mils.
   4. Kelly-Moore; 971 Acry-Prime Interior Latex Primer/Sealer: Applied at a dry film thickness of not less than 1.6 mils.

5. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil.
6. Sherwin-Williams; ProMar 200 Zero VOC Latex Wall Primer B28W2600 Series: Applied at a dry film thickness of not less than 1.5 mils.

D. Interior Plaster Primer: Factory-formulated latex-based primer for interior application.
1. Benjamin Moore; Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253: Applied at a dry film thickness of not less than 1.2 mils.
2. Coronado; 40-11 Super Kote 5000 Latex Primer-Sealer: Applied at a dry film thickness of not less than 1.2 mils.
3. ICI Dulux Paints; 3210-1200 Ultra-Hide Aquacrylic GRIPPER Stain Killer Primer Sealer: Applied at a dry film thickness of not less than 1.8 mils.
4. Kelly-Moore; 247 Chem-Guard Acrylic Masonry Primer: Applied at a dry film thickness of not less than 1.9 mils.
5. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil.
6. Sherwin-Williams; ProMar 200 Zero VOC Latex Wall Primer B28W2600 Series: Applied at a dry film thickness of not less than 1.5 mils.

E. Interior Plaster Primer at inside plaster face of all exterior walls: Factory-formulated latex-based primer for interior application.
1. Sherwin-Williams; High Build Primer Latex Wall Primer B28W8601 Series: Applied at a dry film thickness of not less than 3.0 mils.
2. No substitutions.

F. Interior Wood Primer for Full-Gloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.
1. Benjamin Moore; Moorcraft Super Spec Alkyd Enamel Underbody and Primer Sealer No. 245: Applied at a dry film thickness of not less than 1.5 mils.
2. Coronado; 78-11 Super Kote 5000 Acrylic Enamel Undercoat: Applied at a dry film thickness of not less than 2.0 mils.
3. ICI Dulux Paints; 1120-1200 Ultra-Hide Oil/Alkyd Interior Wood Undercoat: Applied at a dry film thickness of not less than 2.0 mils.
4. Kelly-Moore; 985 Flo-Cote Alkyd Enamel Undercoater: Applied at a dry film thickness of not less than 2.5 mils.
5. Pittsburgh Paints; 6-6 SpeedHide Interior Quick-Drying Enamel Undercoater: Applied at a dry film thickness of not less than 1.4 mils.
6. Sherwin-Williams; Premium Wall and Wood Interior Latex Primer B28W8111 Series: Applied at a dry film thickness of not less than 1.8 mils.

G. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.
1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils.
2. Coronado; 35-147 Rust Scat Alkyd Metal Primer: Applied at a dry film thickness of not less than 2.0 mils.
3. ICI Dulux Paints; 4160-6130 Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils.
4. Kelly-Moore; 1711 Kel-Guard Alkyd White Rust Inhibitive Primer: Applied at a dry film thickness of not less than 2.0 mils.
5. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 1.5 mils.
6. Sherwin-Williams; Pro-Cryl Universal Primer B66-310 Series: Applied at a dry film thickness of not less than 3.0 mils.

H. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils.
2. Coronado; 36-11 Rust Scat Acrylic Metal Primer: Applied at a dry film thickness of not less than 2.0 mils.
3. ICI Dulux Paints; 4160-6130 Devguard Multi-Purpose Tank & Structural Primer: Applied at a dry film thickness of not less than 2.0 mils.
4. Kelly-Moore; 1722 Kel-Guard Acrylic Galvanized Iron Primer: Applied at a dry film thickness of not less than 1.8 mils.
5. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
6. Sherwin-Williams; Pro-Cryl Universal Primer B66-310 Series: Applied at a dry film thickness of not less than 3.0 mils.

2.06 EXTERIOR FINISH COATS

A. Exterior Full-Gloss Acrylic Enamel for Ferrous and Other Metals (Lintels, Trim, Partitions, and wainscot): Factory-formulated full-gloss waterborne acrylic-latex enamel for exterior application.
   1. Benjamin Moore; Moore's IMC Acrylic Gloss Enamel M28: Applied at a dry film thickness of not less than 2.0 mils.
   2. Coronado; 80 Line Rust Scat Acrylic Latex High Gloss Enamel: Applied at a dry film thickness of not less than 1.4 mils.
   3. ICI Dulux Paints; 3028-XXXX Dulux Interior/Exterior Acrylic Gloss Finish: Applied at a dry film thickness of not less than 1.6 mils.
   4. Kelly-Moore; 5780 DTM Acrylic Gloss Enamel: Applied at a dry film thickness of not less than 1.7 mils.
   5. Pittsburgh Paints; 90-300 Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamels: Applied at a dry film thickness of not less than 3.0 mils.
   6. Sherwin-Williams; Pro Industrial Acrylic Gloss B66-600 Series: Applied at a dry film thickness of not less than 2.5 mils.

B. Exterior Semi-Gloss Acrylic Enamel for Ferrous and Other Metals: (Lintels, Trim, Partitions, and wainscot): Factory-formulated semi-gloss waterborne acrylic-latex enamel for exterior application.

   Sherwin-Williams; Pro Industrial Acrylic Semi-Gloss B66-650 Series: Applied at a dry film thickness of not less than 2.5 mils.

C. Exterior Wood, Cement, or Brick Flat Finish: Sherwin-Williams A-100 Exterior Latex Flat, A6-100 Series. Applied at a dry film thickness of not less than 1.2 mils.

D. Exterior Wood, Cement, or Brick Satin Finish: Sherwin-Williams A-100 Exterior Latex Satin, A82-100 Series. Applied at a dry film thickness of not less than 1.5 mils.

E. Exterior Textured Coating: Sherwin-Williams Ultra Crete Medium Textured Coating, A44W811. Applied at 50-80 sq. ft/gal.

F. Exterior Metal Canopy Semi-Gloss Sherwin-Williams SprayLastic Exterior Semi-Gloss Waterborne Dryfall, B42W17/B42T17. Applied at a dry film thickness of not less than 2.0 mils.

G. Exterior Stained Wood Semi-Transparent: Sherwin-Williams WoodScapes Exterior Polyurethane Semi-Transparent Stain, A15T5.

2.07 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application: ProMar 200 Zero VOC Interior Latex Flat. Applied to a dry film thickness of not less than 1.6 mils.

B. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel: Promar 200 Zero VOC Interior Eg-Shel. Applied to a dry film thickness of not less than 1.7 mils.
C. Interior Semi-Gloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.
    1. Benjamin Moore; Moorcraft Super Spec Latex Semi-Gloss Enamel No. 276: Applied at a dry film thickness of not less than 1.2 mils.
    2. Coronado; 32-Line Super Kote 5000 Latex Semi-Gloss Enamel: Applied at a dry film thickness of not less than 1.3 mils.
    3. ICI Dulux Paints; 1406-XXXX Dulux Professional Acrylic Semi-Gloss Interior Wall & Trim Enamel: Applied at a dry film thickness of not less than 1.5 mils.
    4. Kelly-Moore; 1649 Acrylic-Latex Semi-Gloss Enamel: Applied at a dry film thickness of not less than 1.7 mils.
    5. Pittsburgh Paints; 6-500 Series SpeedHide Interior Semi-Gloss Latex: Applied at a dry film thickness of not less than 1.0 mil.
    6. Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss Enamel B31-2600 Series: Applied at a dry film thickness of not less than 1.6 mils.
D. Interior Full-Gloss Acrylic Enamel: Factory-formulated full-gloss acrylic-latex interior enamel.
    1. Benjamin Moore; Moore's IMC Acrylic Gloss Enamel No. M28: Applied at a dry film thickness of not less than 2.0 mils.
    2. Coronado; 414 Line Super Kote 5000 Acrylic High Gloss Enamel: Applied at a dry film thickness of not less than 1.4 mils.
    3. ICI Dulux Paints; 3028-XXXX Dulux Interior/Exterior Acrylic Gloss Finish: Applied at a dry film thickness of not less than 1.6 mils.
    4. Kelly-Moore; 1680 Dura-Poxy Gloss Acrylic Enamel: Applied at a dry film thickness of not less than 1.6 mils.
    5. Pittsburgh Paints; 90-374 Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
    6. Sherwin-Williams; Solo 100% Acrylic Interior/Exterior Gloss: Applied at a dry film thickness of not less than 1.6 mils.
E. Interior Full-Gloss Alkyd Enamel for Wood and Metal Surfaces: Factory-formulated full-gloss alkyd interior enamel.
    1. Benjamin Moore; Moore's IMC Urethane Alkyd Enamel No. M22: Applied at a dry film thickness of not less than 2.0 mils.
    2. Coronado; 1223 Line Super Kote 5000 High Gloss Alkyd Enamel: Applied at a dry film thickness of not less than 1.7 mils.
    3. ICI Dulux Paints; 4308-XXXX Devguard Alkyd Industrial Gloss Enamel: Applied at a dry film thickness of not less than 2.0 mils.
    4. Kelly-Moore; 1630--Kel-Cote Interior Alkyd Semi-Gloss Enamel: Applied at a dry film thickness of not less than 2.2 mils.
    5. Pittsburgh Paints; 7-814 Series Pittsburgh Paints Industrial Gloss-Oil Interior/Exterior Enamel: Applied at a dry film thickness of not less than 1.5 mils.
    6. Sherwin-Williams; ProMar 200 Alkyd Gloss Enamel B35-200 Series: Applied at a dry film thickness of not less than 1.5 mils.
F. Interior Full Gloss Epoxy:
    1. Sherwin-Williams; Tile-Clad High Solids Epoxy B62Z series: Applied at a dry film thickness of not less than 2.5 mils.
G. Interior Precatalysed Water-Based Epoxy:
    1. Sherwin-Williams; Pro Industrial Pre-Catalysed Water-based Epoxy K45-150 Series (Egg-shell): Applied at a dry film thickness of not less than 1.5 mils.
    2. To be installed at (previously painted) interior existing brick and CMU surfaces; and interior plaster surfaces of exterior walls.

H. Interior DryFall, Water Based Flat, for Galvanized Steel Decking: Sherwin-Williams Pro Industrial Waterborne Acrylic Dryfall B42W81.

2.08 INTERIOR WOOD STAINS AND VARNISHES

A. Interior Oil Stain: Sherwin-Williams Wood Classics Oil Stain A49-200 Series, or comparable.
   1. Color: As noted in drawings.
B. Clear Sanding Sealer: Factory-formulated fast-drying alkyd-based clear wood sealer applied at spreading rate recommended by manufacturer. Use sanding sealer as may be required to reduce quantity of stain soaked in by porous woods such as cedar, and/or to achieve approved color and effect as approved by sample and mockup reviews specified in other sections.
   1. Coronado; 81-10 Dual Seal.
   2. ICI Dulux Paints; 1902-0000 WoodPride Interior Satin Polyurethane Varnish.
   3. Kelly-Moore; 2164 E Z Sand Alkyd Q. D. Sealer.
   4. Pittsburgh Paints; 6-10 SpeedHide Quick-Drying Interior Sanding Wood Sealer and Finish.
   5. Sherwin-Williams; Wood Classics Fast Dry Sanding Sealer B26V43.
C. Interior Alkyd- or Polyurethane-Based Clear Satin Varnish: Factory-formulated alkyd- or polyurethane-based clear varnish.
   1. Coronado; 67-100 Polyurethane Liquid Plastic Satin Varnish.
   2. ICI Dulux Paints; 1902-0000 WoodPride Interior Satin Polyurethane Varnish.
   3. Kelly-Moore; 2050 Kel--Aqua Stain Base.
   4. Pittsburgh Paints; 77-7 Rez Varnish, Interior Satin Oil Clear.
   5. Sherwin-Williams; Wood Classics Fast Dry Oil Varnish, Satin A66-300 Series.

2.09 MISCELLANEOUS PAINT PRODUCTS

A. Epoxy: Two component epoxy coating shall be Sherwin-William's "Tile-Clad High Solids Epoxy #B62Z Series, or approved equal.
B. Semi-transparent water repellent wood preservative stain shall be Olympic's Semi-Transparent Oil Base Stain, or equal.
C. Other materials such as linseed oil, turpentine and shellacs shall be pure and of highest quality.
D. Acrylic Concrete Coating: Exterior concrete coating shall be "Thorocoat" 100% acrylic, textured coating as manufactured by Thoro System Products, Miami, Florida. Color as selected by Architect.
E. Concrete Floor Sealer: Exposed concrete floor slabs with smooth troweled finish: One coat flood-applied, hardener/densifier. Chemical reactive silicate / siliconate formulation that enhances sheen level of troweled concrete and is designed to mainatin or increase sheen level over time with normal wear. Provide one of the following or approved equal product by another Manufacturer:
   a. Euclid Chemical Company; "Euco Diamond Hard", www.euclidchemical.com.
   b. CureCrete Chemical Company; "Ashford Formula", www.ashfordformula.com.
   c. Dayton Superior; "Sure-Hard Densifier J17", www.daytonchemical.com.
   d. L&M Construction Chemicals: "Seal Hard", www.lmmc.com.
F. Epoxy Coating: Interior concrete block to receive coating shall be filled using a modified epoxy masonry filler equal to Tnemec's No. 54-660 and receive epoxy-polyomide coating equal to Tnemec's Series 66 HiBuild Epoxoline.
G. Exterior Concrete Block Protective Coating: One part, water based, cross linked copolymer coating shall be Rainguard Products Company's "Vandl-Guard Graffiti Resistant Coating", or approved equal.

H. Concrete Block Sealer: Waterproofing clear penetrating sealer shall be "Rainguard Micro-Seal" as manufactured by Rainguard Products Co., or approved equal. Install at coverage rate determined adequate by manufacturer's representative.
I. Sealer Thinner: Sonneborne's "Reducer 990", or approved equal.
J. Wood Sealer: Penetrating water-repelling sealer shall be Olympic, "Water Guard".
K. Waterbased Epoxy: Catalyzed epoxy meeting requirements of ASTM D3730, equal to Sherwin Williams B67 Series.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
   1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
   2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
   1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.02 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
   1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
   1. Provide barrier coats over incompatible primers, or remove and re-prime.
   2. Cementitious and Masonry Materials: Prepare brick, concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
      a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
      b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
   3. Wood: Clean new or existing surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view down to consistent substrate for intended finish. Ensure smooth surface remains and remove all residual dust.

a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, trim, rails, doors, frames and windows.
c. If transparent finish is required, backprime with spar varnish.
d. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Concrete floor surfaces to remain exposed shall be cleaned and properly acid etched per floor sealer manufacturer's instructions. Fill and patch holes, crevices, cracks, etc.. Remove any paint, soil, loose material and dust. Remove oil or grease with a hot TSP solution and rinse thoroughly. Floor to be completely dry prior to etching with muriatic acid and water solution.

3.03 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
10. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
   1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
   2. Omit primer over metal surfaces that have been shop primed and touchup painted.
   3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
   4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
   1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
   2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
   3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:
   1. Uninsulated metal piping.
   2. Uninsulated plastic piping.
   3. Pipe hangers and supports.
   4. Tanks that do not have factory-applied final finishes.
   5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
   6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
   7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
   8. New rooftop gas piping.
   9. All existing and new exterior conduit, gas, water and similar piping at face of exterior walls.

G. Electrical items to be painted include, but are not limited to, the following:
   1. Switchgear.
   2. Panelboards.
   3. Electrical equipment that is indicated to have a factory-primed finish for field painting.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
   1. Provide satin finish for final coats.

L. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.04 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
   1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.05 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
   1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces prior to final inspection. Comply with procedures specified in PDCA-P1.

3.06 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
   1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.
      a. Primer: Exterior ferrous-metal primer.
      b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.

B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:
   1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a galvanized metal primer.
      a. Primer: Exterior galvanized metal primer.
      b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.

C. Wood Doors: Provide the following paint finish systems over wood surfaces:
   1. Gloss Latex Finish: Two finish coats over a wood primer.
      a. Primer: latex wood primer.
      b. Finish Coats: gloss latex for wood surfaces.

D. Cement Fiber Board: Provide the following paint finish systems over cement fiber board surfaces:

1. Latex Satin Finish: Two finish coats over primer.
    a. Primer: Loxon concrete primer.
    b. Finish Coats: latex satin finish.

3.07 INTERIOR PAINT SCHEDULE

A. New Concrete Unit Masonry: Provide the following finish systems over new interior concrete masonry:
    1. Semigloss Acrylic-Enamel Finish: Two finish coats over a block filler.
        a. Block Filler: Concrete unit masonry block filler.
        b. Finish Coats: Interior semigloss acrylic enamel.
B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
    1. Semigloss Acrylic-Enamel Finish: (typical) Two finish coats over a primer.
        a. Primer: Interior gypsum board primer.
        b. Finish Coats: Interior semigloss acrylic enamel.
    2. Full Gloss Epoxy Finish: (at Kitchen Food Prep, Pantries, Support spaces with direct access to Apparatus Bays, shower rooms, and restrooms): Two finish coats over primer.
        a. Primer: Interior gypsum board primer.
        b. Finish Coats: Interior polyester epoxy.
C. Wood and Hardboard: Provide the following paint finish systems over interior wood surfaces:
    1. Full-Gloss Alkyd-Enamel Finish: Two finish coats over a wood primer.
        a. Primer: Interior wood primer for full-gloss alkyd-enamel finishes.
        b. Finish Coats: Interior full-gloss alkyd enamel for wood and metal surfaces.
D. Ferrous Metal: Provide the following finish systems over ferrous metal:
    1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.
        a. Primer: Interior ferrous-metal primer.
        b. Finish Coats: Interior full-gloss acrylic enamel.
E. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
    1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.
        a. Primer: Interior zinc-coated metal primer.
        b. Finish Coats: Interior full-gloss acrylic enamel.
F. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:
    1. Flat Acrylic Finish: Two finish coats. Add fungicidal agent to render fabric mildew proof.
        a. Finish Coats: Interior flat latex-emulsion size.
G. Interior Concrete Floors: Provide the following:
    1. 1st coat - Sealer / Reducer (400 SF/gal.)
    2. 2nd coat - Sealer / Reducer (600 SF/gal.)
        a. Exposed Concrete Finished Floors.

3.08 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE

A. Natural-Finish Woodwork: Provide the following natural finishes over new interior woodwork not specified as shop finished:
    1. Alkyd-Based Satin-Varnish Finish: Two finish coats of alkyd-based clear satin varnish over a sanding sealer. Provide wood filler on open-grain wood before applying first varnish coat.
        a. Sealer Coat: Clear sanding sealer.
        b. Finish Coats: Interior alkyd- or polyurethane-based clear satin varnish.

END OF SECTION 09 91 00

SECTION 10-1400 – SIGNAGE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Work includes all labor, materials, equipment and services necessary to furnish and install all signage as shown on the Drawings and as herein specified.
B. Related Sections include the following:
   1. Division 01 - for Project Identification signage.
   2. Division 03, Section "Polished Concrete Floor Finishing", for sign/graphics installed as part of flooring system.
   3. Division 05 - Section "Metal Fabrications", for vehicular sign posts.
   4. Division 06 - Section "Rough Carpentry", for blocking in walls.
   5. Division 09 - Section "Gypsum Board Assemblies".
   6. Division 10 - Section "Fire Protection Specialties", for fire extinguisher / cabinets signage.
   7. Division 26 - For lighting and electrical requirements for lit signage.
   8. Division 32 - Section "Pavement Specialties", for fire lane, directional, and other pavement markings.
   9. Division 32 - Section "Chain Link Fences and Gates", for safety signage for motorized gates.

1.03 SUBMITTALS

A. Submit shop drawings for all work for review prior to fabrication of materials. Shop drawings of individual letter signage shall indicate spacing. Shop drawings of all signage shall be drawn to scale, letter characters in type style specified and spacing shown exactly as sign is to be fabricated.
B. Submit samples of all colors for selection by Architect and materials proposed for use prior to fabrication.
C. Submit two product sample signs with pictogram, tactile characters, and Braille.
D. Submit sign schedule location key plan for all signage.
E. Sign schedule location key plan: Signage contractor shall submit a first draft sign schedule and location key plan for all signage in editable electronic format (excel preferred). Preliminary submittal shall indicate all proposed sign locations, types, and message copy. Architect will mark up the draft schedule and location plan. Make corrections and resubmit sign schedule and location plan until approved by Architect.
   1. Signage contractor shall spell check all signage copy and inform Architect in the final sign schedule submittal to confirm suspected misspellings.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Materials properly protected and packaged so that no damage occurs during transit. Materials when delivered, protected by the Contractor against damage or theft.

1.05 QUALITY ASSURANCE

A. Signage shall meet government regulation for raised image signage and criteria of the Americans with Disabilities Act.
   1. Contractor shall be responsible for all ADA and local accessibility code signage requirements, regardless of whether they are specifically shown on the drawings or specified herein. Notify Architect of any conflicts or deficiencies. Any signage deficiencies noted by Authorities having Jurisdiction at the conclusion of the project shall be remedied by Contractor at no additional cost to the Owner.

1.06 WARRANTY

A. Fabricator's Special Warranty: Manufacturer / Fabricator agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
   1. Deterioration of finishes beyond normal weathering.
   2. Deterioration of printed images.
   3. Separation or delamination of sheet materials and components.
   4. Failure of mechanical fasteners or components.
   5. Separation of signs from substrates due to improper substrate preparation or due to inadequate strength or quantity of fasteners or adhesives.
      a. If defect is exhibited in a significant number of locations to indicate a systemic issue, corrections to attachments shall be made holistically to the type(s) of signs exhibiting the defect.
   6. Warranty excludes damage due to vandalism or abuse.
   7. Warranty Period: One years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Signage Design, General: Information on Drawings and as specified herein establish the design intent only, showing requirements for respective aesthetic effects and performance characteristics of signage but not necessarily all fabrication details required for complete sign installations.
   1. Architect will provide a preliminary signage schedule, with all preliminary proposed copy. Signage contractor is responsible to translate into complete signage submittal package for Architect's review and comment, and Owner approval.
   2. Architect or Owner will provide electronic graphic files in vector format acceptable to signage fabricator for use in preparing all printed graphic images.

B. Font for Copy: Unless otherwise noted in Drawings or otherwise approved by Architect, provide font characters.
   1. Where or if individual characters conflict with handicap accessible code requirements, replace individual characters with similar appearance characters compliant with code requirements, or replace with similar appearance compliant font, as approved by Architect.

C. Accessibility Standards: Comply with accessibility standards indicated in References article. In the event of apparent conflict between Requirements and signage design indicated, notify Architect via submittal process and suggest corrections to design to maintain design intent and resolve the conflict. Coordinate with Architect to resolve conflicts in satisfactory manner.

1. Architect's review and approval of submittals is for general conformance with design intent and does not constitute review or approval of handicap accessible features.
2. Signage fabricator is solely responsible to fabricate signs requiring accessible features in compliance with the provisions of applicable handicap accessibility codes. In event that non-compliant signage is installed and verified by authorities having jurisdiction as non-compliant, fabricator shall replace identified non-compliant signage with compliant signage of similar design, without additional cost to Owner.

2.02 MATERIALS

A. Materials, General: Materials and equipment as well as workmanship shall conform to the highest commercial standards available. Parts not identified specifically on Drawings shall be materials appropriate to job site conditions. All color changes made with sharp, clean even edges providing clear separation of sign copy.
B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
C. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
D. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
E. Printable and Frosted Window Film: - 3M Scotch Series 7725SE special Effects Film, B-free window films JT5798M BF and JT5999M BF by Morgan Adhesives, 3M CRYSTAL Glass Finishes 314 Dusted Crystal, HD Clear high definition decorative film by HDClear and approved equal materials approved by printing vendor.
F. Vinyl Film: UV-resistant vinyl film of nominal thickness indicated, with pressure-sensitive, permanent adhesive on back; die cut to form characters or images as indicated and suitable for exterior applications.
G. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.03 MATERIALS - SPECIFIC

A. Interior Room Identification Signage: Unframed, photopolymer, ADA compliant raised character signs with Braille. System available with changeable message windows and exterior grade options where indicated. System equal to ASI Signage, ADA-Ready, "In-Touch" Sign System. Allow for one room identification signs.
    1. Sign Size: As indicated in Drawings or minimum size to accommodate requirements on sign with largest message.
    2. Sign Shape: Rectangular with square corners.
    3. Sign Materials:
        a. Face: Photopolymer face, in matte (non-glare) finish.
        b. Backing plate: Acrylic
        c. Exterior-entry Rooms: Where room signage is required for exterior-entry rooms, provide UV-Resistant, Exterior-Grade signage.
    4. Fabrication Options
        a. Tactile Graphics and Text:
            1) Fabrication process: Provide tactile copy and grade 2 Braille raised 1/32 inch minimum from plaque first surface by manufacturer's photopolymer bonded process. Sign face of single material, tactile characters and Braille integral to photopolymer. Adhesive-fixed characters are not acceptable.
            2) Provide lettering and graphics precisely formed, uniformly opaque to comply with relevant ADA regulations and requirements indicated for size, style, spacing, content, position, and colors. Tactile characters to be raised min. 1/32" from

surface. Computerized translation of sign copy to be responsibility of the manufacturer.

3) Provide signs with ADA compliant pictograms at restroom and locker room signs.

b. Pictograms: Pictograms shall comply with recognized standards and locally enforced accessibility codes. Integrate verbal text descriptors and Braille below each raised pictogram, outside of the pictogram field.

1) In addition to male/female pictograms, provide a "wheelchair" international handicap accessibility symbol on the signage for all accessible restrooms and bathing / shower rooms.

a) Where these rooms are non-accessible and there is not an adjacent accessible room, provide signs to direct to the nearest accessible room. Message "ACCESSIBLE RESTROOM (Shower, Locker Room, etc.) AVAILABLE AT <indicate location>", with direction arrow where applicable. These signs are visual only, without raised characters or Braille.

c. Mounting Panel Options:

1) Size: Same size.

2) Thickness: 0.080 inch thick matte finished acrylic.

d. Background Appearance Options: Solid color as selected by Architect from manufacturer's standard range.

e. Tactile Lettering and Graphics Color Options: Selected by Architect from manufacturer's standard colors.

f. Letter style and color: Selected by Architect from manufacturer's standard letter styles and color charts.

g. Letter size and layout position: 1" high room identification letters, unless otherwise approved by Architect. In no case shall size be less than that required by handicap accessibility standards.

5. Installation Method

a. Manufacturers recommended adhesive, or high strength clear vinyl tape.

b. Where attachment is to glass sidelights, provide high strength clear vinyl tape attachment, with solid color blank backplate on reverse side matching sign color and size.

6. Fabrication - General

a. General: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction. Sign fabricator is responsible to double check all requirements related to ADA and Texas Accessibility Standards requirements for accessible signs, in preparation of shop drawings and prior to sign fabrication. Signs fabricated that do not comply with these requirements shall be re-made in compliance with requirements at Fabricator's expense.

b. Preassemble signs in the shop to the greatest extent possible to minimize field assembly. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in a location not exposed to view after final assembly.

c. Conceal fasteners if possible; otherwise, locate fasteners to appear inconspicuous.

d. Form panels to required size and shape. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.

e. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.

f. Exterior grade signs: Provide exterior grade signs where mounted outside of weather protective building enclosure.

B. Fire Evacuation Maps: Provide one at each required exit that is not an accessible means of egress. Colors as selected by Architect. Allow for max. 6 signs. Signs shall be 16" x 8" photopolymer with applied graphics matching room identification signage design and shall

depict floor plan and route to exit. Install at locations designated by Architect and as approved by Fire Marshall. All signs must be ADA compliant.

1. All signage printed on backplate, or subsurface print as applicable to sign type. Raised characters and Braille are not required.
2. Sign Requirements: Signs shall depict a floor plan image for the floor level, including all exits from that level. Accessible exits shall be denoted with a wheelchair symbol of accessibility. Sign shall indicate location of the sign with a red dot or other approved location indicator. Arrows shall indicate the direction to the two nearest means of egress.
    a. Sign Message at Non-Handicap-Accessible Exits and Areas of Refuge: message shall indicate "ACCESSIBLE EXIT AT <ROOM NAME>". The matching room name shall also be provided on the floor plan sign graphic adjacent to the accessible exit.
3. Graphics: Provided by Architect in non-vector electronic file format. Conversion to vector format graphics as required for fabrication provided by signage fabricator.

C. Stair Exit Enclosure Identification Signage: At each vertical exit enclosure (stairs, ramps, or combination thereof) connecting more than 3 stories or levels, provide a sign within the exit enclosure at each level. Provide signs to match design of interior room signage.
    1. Fire Department and Egress Signs: Provide these signs in compliance with handicap accessible code for visual signage. Raised characters and Braille are not required. Mount signs at 5'-0" above the landing level at each floor level, in a location not obstructed to view with doors in open or closed positions.
        a. Message shall include the following:
            1) "STAIR #_" indicating the stair number.
            2) Designation of floor levels: "LEVEL #".
            3) Identification of Egress Level: "EXIT AT LEVEL #" or similar message indicating nearest egress level, with a directional arrow indicating if that egress level is above or below the current level.
        b. Size: Minimum 12"x18", or larger where required to fit message.
        c. Lettering Sizes:
            1) Stair number: 1-1/2" tall.
            2) Level Number: "LEVEL" 1-1/2" tall, and the floor number 5" tall.
            3) All other Lettering: 1" tall.
        d. Colors To match room identification signage.
    2. Handicap Accessible Level Identification: Provide these signs with raised letters and Braille. Mount signs in handicap accessible position at each door into the exit enclosure.
        a. Message shall include the following:
            1) "STAIR #_" indicating the stair number.
            2) Designation of floor levels: "LEVEL #".
        b. Size and color of signs to match interior room identification signage.

D. Tactile Exit Signs: Provide signs to match design of interior room signage tactile exit signs with raised letters and Braille at rooms and corridors that serve as exit passageways and exit discharges, as required by local code, including any space that can be interpreted as an Area of Refuge, Exit Stairway, Exit Ramp, Exit Passageway and Exit Discharge. Size signs 6"x4" to match interior room identification signage , or larger as required to fit "EXIT" message and braille in same size and font text as handicapped accessible room signage. Colors as selected by Architect.
    1. Where there is room identification signage scheduled for the same door and the text and Braille message of the tactile exit sign will fit on the room identification signage below the room identification message, incorporate both signs into one sign.

E. Miscellaneous Handicap Accessibility Signage: Provide photopolymer plaque matching design of interior room identification signage mechanically mounted sign to match design of room identification signage, unless otherwise noted. Colors as selected by Architect.
    1. Directional Signage to Accessible Entries: Provide one of the following at each entrance door where not all entries to the building are handicap accessible:

a. Exterior Directional Signage: At non-accessible entrances, provide exterior grade sign plaque with message to direct to the nearest accessible entrance.
   1) Mounting: Mechanically fasten to building wall near entry door. Provide sign with raised characters and Braille.
b. Accessibility Symbol: At each accessible entrance, provide an international symbol of accessibility pictogram as follows:
   1) At glazed entry doors, provide 6" vinyl die-cut symbol, in color selected by Architect. Mount on glass adjacent to an accessible entry door, or where there is no sidelight, mount on door glass.
   2) At opaque entry doors, provide 6"x6" exterior grade sign plaque mechanically fastened to adjacent wall substrate.
   3) Along the accessible path to the main entry provide 6"x8" exterior grade sign plaque with accessibility symbol and direction arrow indicating direction of path to accessible entry. Mount sign through bolted to 2"x2" galvanized steel tube posts, 18" tall above grade post mounted 18" into minimum 9" diameter x 2'-0" deep concrete base. Provide signs with accessible visual message but not with raised characters or Braille. Mount in yard / landscaping area in location designated by Architect.

F. Storm Shelter Signage: As indicated in Storm Shelter plans (Refer to "G" series Drawings). Provide signs of similar materials and design to Stairwell ID signage.
   1. Instructional signage for Storm Shelter deployment: See Storm Shelter Drawings (refer to G series sheets and MEP Drawings). Coordinate exact text with operation of dampers and other actions required to deploy the bunker gear and decontamination room to storm shelter mode.

G. Lobby and other Communications and Use Instructions: Coordinate with Division 28 for signage to be provided with two-way communications signage, indicating instructions for use of each communication device. Provide ¼" acrylic sign plaques with ADA compliant visual messages of sizes as required to accommodate messages. Font as similar to Room ID plaques, with red color background and white copy:
   1. Door Bell Button Sign: "RING DOORBELL FOR ASSISTANCE – IN EVENT OF EMERGENCY CALL 911", or similar message as approved by Fire Department.

H. Directional Signs at Apparatus Bay Door Control Buttons: Provide ¼" thick acrylic sign plaques with visual message (no braille) indicating Bay Doors button controls. Signs of each type to be of equal size to accommodate largest message in 1" high letters. Background color as selected by Architect with white copy. Provide signs as follows:
   1. (8) sets of signs, one set for each of the banks of 3-button door controls. Signs arranged vertically to the left of buttons to indicate "Door" and arranged horizontally above the buttons indicating "Bay 1", "Bay 2", "Bay 3" etc. Another sign above the other signs reading "FRONT" or "REAR" to indicate which side of the bay the buttons control. Coordinate with Electrician to install door control buttons in proper sequence to match signage.

I. Directional Signs for gas solenoid controls in Kitchen and Patio: Provide ¼" thick acrylic sign plaques with visual message (no braille) for gas solenoid button controls. Signs of each type to be of equal size to accommodate largest message in 1" high letters, unless otherwise instructed by Architect. Background color as selected by Architect with white copy. Provide signs as follows:
   1. For Fire Alarm / Hood override button: "HOOD / FIRE ALARM RESET BUTTON" or similar message acceptable to authorities having jurisdiction.
   2. For Gas Range Station Alerting Reset Button: "1. TURN OFF ALL GAS AT RANGE 2. PUSH BUTTON TO RESET 3. PUSH RESTRIKE BUTTONS ON RANGE TO LIGHT PILOTS"
   3. For Outdoor Gas Grill Alerting Reset Button: "GAS GRILL RESET BUTTON".

J. Exterior Vehicular Traffic Signage: Provide Aluminum signs with 1" radius corners, shop painted and screw attached to posts set in concrete footing. Refer to Division 05 Section

"Metal Fabrications" for posts. Coordinate lengths of posts for mounting heights compliant with requirements of authorities having jurisdiction. Provide engineering grade signs unless otherwise required by authorities having jurisdiction.

1. Vehicular signs at street: Comply with all specifications and requirements of local authority having jurisdiction as applicable, for signs at streets, including but not limited to sign size, gauge, attachment, pole types, and mounting heights. These are typical gauges that signs come in, we rarely use larger signs:

1. Aluminum Thickness:
   a. For signs up to 12”x18”: Minimum of 18 gauge (.04) Aluminum
   b. For signs up to 30”x30”: Minimum of 16 gauge (.05) Aluminum
   c. Or thicker than above where required to match standards required by authorities having jurisdiction.
2. Stop, Yield, Pedestrian Crossing and other Warning Signs, and Do Not Enter Signs: 30"x30".
3. Parking, No Parking, Reserved Parking and other Parking Restriction, Speed Limit, Authorized Vehicles Only, Buses Only, and similar message signs: 18"x24".
4. No Right Turn, No Left Turn, and similar signs: 24"x24".
5. Wrong Way: 30"x18".
6. One Way Signs: 36"x12".
7. Remote Fire Department Connection (FDC) , FACP and Fire Riser Room Signs: To match standards of local authorities having jurisdiction.
   a. FDC Sign: If not otherwise specified by authorities having jurisdiction, provide approximately 8”x8” sign, with red background with white border and 3” high white “FDC” lettering, and 1-1/2” high street address number, mounted on post 3’ above grade to bottom of sign.
   b. FACP Sign: If not otherwise specified by authorities having jurisdiction, provide approximately 6”x8” sign, with red background with white border and 4” high white “FACP” lettering, mounted at the exterior side of door where the FACP is located, in location as indicated by Architect and acceptable to Fire Marshal.
   c. Fire Riser Room Sign: If not otherwise specified by authorities having jurisdiction, provide approximately 8”x12” sign, with red background with white border and 2” high white “FIRE RISER ROOM” lettering mounted at exterior side of door to the fire riser room, in a location as indicated by Architect and acceptable to Fire Marshal.
8. Handicap Accessible Parking Signs: Refer to site plan and handicap signage detail on Drawings for parking signage at handicapped accessible spaces. Provide one sign per handicap accessible parking space, one van accessible parking space shall indicate van accessible. Comply with ADA requirements for sign types and mounting height.

K. Aluminum Sign Letters: All Sign letters shall be by a single manufacturer or fabricator and shall match in font, color, finish, and other visual characteristics, unless otherwise indicated. Letters and mounting shall be designed by manufacturer to withstand design loads. Type Style As Selected by Architect.
   1. Aluminum Letters (LED Backlit): Fabricated aluminum, cut metal letter, equal to ASI Modulex LF Series architectural letters.
      a. Material: Aluminum.
      b. Finish: See below.
      c. Sizes: Letters shall be sized (below) and located as per drawings high.
         1) “CITY OF YORK CENTRAL FIRE STATION" – 1’-0” tall (Anodized Bronze)
         2) “CITY OF YORK" – 1’-6” tall (Anodized Bronze)
         3) “CENTRAL FIRE STATION" – 1’-3” tall (Anodized Bronze)
         4) “1714 N LINCOLN AVE”- 7” tall (Anodized Bronze)
         5) City of York Fire Department Seal – 8’-1 x 8’-1 (Anodized Bronze)
      d. Depth of Return: 2" deep.
      e. Type style: As selected by Architect.

f. Mounting: Mount as per method "Projecting Stud Mount" with anchors and projected 2 inches from wall.
g. LED Backlight color as selected by Architect from Manufacturer's full range.

L. Building Plaque: One 16” x 32” wide, Cast Aluminum Plaque, as manufactured by Southwell, O.M.C., A.R.K. Ramos, or approved equal. Each plaque is to be cast of aluminum and shall be free of pits and holes. Border and letters shall be raised, satin finish and background shall be oxidized texture. Plaque shall be cleaned and lacquered. Border shall be “double line” and lettering shall be type style as selected by Architect from Manufacturer's available font. Mounting to be lag bolts into solid wood blocking in wood stud wall. Architect shall provide layout and copy requirements for each sign, and Architect and Owner shall approve rubbing prior to casting.

PART 3 - EXECUTION

3.01 EXAMINATION AND COORDINATION

A. Coordinate mounting requirements for exterior substrates with other trades as required, including adequate strength and structural reinforcements where necessary.
B. Coordinate with other trades as required for blocking in walls, electrical requirements, requirements for substrate preparation, and other requirements for signage installation as applicable.
C. Examine installation areas to ensure that conditions are suitable for installation.
D. Examine existing conditions for construction or obstructions that prohibit signage to be installed in typical locations per ADA standards. Where location for ADA compliant mounting location is unclear, request clarification from Architect.
E. Examine signage for defects prior to installation. Do not install damaged signage.
F. Prepare shop drawings and schedule production of dedication plaque with adequate time for review, approval and fabrication to ensure the plaque will be installed at substantial completion, or other date as may be required for dedication ceremony.
    1. Submit initial shop drawings no later than 2 months, plus fabrication time, prior to scheduled substantial completion date, to ensure adequate time for Owner review and approval of dedication plaque.

3.02 PREPARATION

A. Verify mounting locations and types prior to fabrication. Coordinate exact locations with Architect where signs cannot be installed in typical location per ADA Standards. Confirm where backplates etc. are needed for application to glass or similar substrates.
B. Fabricate signs according to approved shop drawings and sign schedule.
C. Clean mounting locations of dirt, dust, grease or similar conditions that would prevent proper installation. This signage contractor responsible to properly clean substrates so that signage may be properly applied.

3.03 INSTALLATION

A. Install products in accordance with suppliers' instructions, using mounting methods as specified and as recommended by sign manufacturer for best results.
    1. Mount with adhesive or high strength tape. Mount secure and tight to substrates.
    2. Mount with high strength double sided mounting tape, with backplates, at all signage applied to glass.
B. All signage and materials installed level, plumb, and true in spacing.

3.04 CLEANING, PROTECTION, AND REPAIR

A. Protect installed signage from damage and soiling due to construction operations.

1. Install interior wall signage after substrates to receive painted finish have been painted, or if painting must be scheduled after initial sign installation mask off or remove and reinstall signs.

B. Remove adhesive, paint, or other spills and smears from sign surfaces, prior to inspection for substantial completion. Clean signs according to manufacturer's or fabricator's instructions. Do not use cleaners or methods that can damage sign surface or finish.

C. Remove any protective coatings at times as recommended by manufacturer or fabricator.

D. Repair scratches and other damage that might have occurred during installation or due to construction operations to satisfaction of the Architect. Evidence of repair should not be visible when viewed with unaided eye at a distance of 5 feet. Remove and replace damaged materials that cannot be repaired to the satisfaction of the Architect.

END OF SECTION 10 14 00

SECTION 10-2613– WALL AND CORNER PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Work includes all labor, materials and services necessary to furnish and install all wall and corner guards as shown on drawings and as herein specified.

1.03 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. Related Sections include the following:
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to the work of this section.
   2. Division 7 Section: Caulking & Sealants
   3. Division 9 Section: Gypsum Wallboard
   4. Division 9 Section:Ceramic Tiling, for Metal edge strips installed as corner guards or edge trimming.
   5. Division 9 Section: Painting

1.04 SUBMITTALS

A. Product Data: Submit product data, installation instructions and maintenance instructions..
B. Shop Drawings: Provide floor plan with proposed endwall guards, corner guard and wall guard locations as required by the contract documents for review. Show mounting heights and details.
C. Sample Selections: Provide samples of manufacturer's standard color range.
D. Verification Samples: Provide three 12” long minimum samples of each type, texture and color selected.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with project requirements, and Basis of Design product intent parameters, manufacturers that may offer specified items which may be incorporated in the Work include the following:
   1. Pawling Corporation, 32 Nelson Hill Road, Wassaic, NY 12592, 800-431-3456, sales@pawling.com
   2. Balco, 2626 S. Sheridan, Wichita, Kansas 67217, 800-767-0082, balcousa.com
   3. Construction Specialties (CS), Dallas 214-340-6400, Corp.800-233-8493, c-sgroup.com
   4. Impro Corporation (IPC), 580 W18766 Apollo Drive, Muskego, WI 53150, 800-222-5556, improcorp.com
   5. Koroseal, 3875 Embassy Parkway, Fairlawn OH, 855-753-5474

SECTION 10-2813 – TOILET ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide accessories as shown on the drawings and as herein specified.
B. Related Sections include the following:
   1. Division 6 Section: Blocking in Stud Walls for Accessories

1.03 QUALITY ASSURANCE

A. Model numbers listed for toilet accessories are items manufactured by Bobrick Corporation unless otherwise noted. Items as made by the Bradley Corp., American Specialties Co. Charles Parker Co. may be used provided materials meet performance and design requirements herein specified.
B. All bathroom fixtures and accessories shall comply with all ADA federal, state and local Handicapped code requirements.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver items in manufacturer's unopened protective cartons. Maintain covers on units until installation is complete. Remove protective covers at final clean-up of installation.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each toilet accessory.

PART 2 - PRODUCTS

2.01 ITEMS

A. Soap Dispensers:
   1. At Public Restroom 103 and Decon Bathroom 128: Wall surface-mounted soap dispenser with spout and 40 oz. soap container. Bobrick No. B2111.
   2. At Bathrooms 116 and 117 in countertops: Countertop mounted recessed soap dispenser with 4" spout and 16 oz. polyethylene soap container. Refill from top. Bobrick No. B-8221, or approved equal.
B. Paper Towel Dispenser / Waste Receptacle:
   1. Recessed mounted stainless steel paper towel dispenser with Towelmate accessory and semi-recessed waste receptacle with heavy duty vinyl 12 gallon liner, equal to Bobrick No. B-36903 Trimline Paper Towel Dispenser Waste Receptacle.
C. Toilet Tissue Dispenser:
   1. Surface-mounted: Bobrick 6867 Double Roll Toilet Tissue Dispenser – Satin Finish.

D. Undersink Pipe Insulation: ADA compliant vinyl cover pipe insulation shall be TRUEBRO "Lav Guard 2", as manufactured by ISP Corp., in standard color, or approved equal.
E. Grab Bars: 1-1/2" diameter satin finish stainless steel grab bar sets with concealed fastenings. Bobrick Series B-6806. Lengths and mounting configurations shall comply with all state and local Handicapped Accessibility code requirements.
F. Towel Bars: 3/4" square, 24" long, stainless steel towel bar with concealed fastenings. Equal to Bobrick Series B-6747.
G. Mop Racks:
    1. Mop and Broom Holder with Hooks and Shelf: Stainless steel with three mop and broom holder clips, four double stainless steel hooks, and 8" deep shelf above, 34" long. Equal to Bobrick B-239. Typically mounted at 78” aff in all work spaces, comply with ADA mounting heights in public spaces.
        a. (1) One at Utility Room 115
        b. (1) One at Bunker Gear Storage 129.
H. Coat and Towel Hooks:
    1. Single Robe Hook: Hook and flange one-piece solid brass with satin nickel-plated finish, surface-mounted with exposed fasteners, equal to Bobrick #B-211.
        a. Provide 3 at each shower. (9 Total)
    2. Coat and Hat Hook: Provide one in each office unless otherwise indicated in Drawings: Satin stainless steel coat and hat hook equal to Bobrick B-6827.
        a. Provide one in each office and dorm room. (8 Total)
I. Folding Shower Seats: Folding shower seat of water resistant, ivory color 1/2" thick phenolic. Frame and mounting brackets of stainless steel and feature self locking mechanism. Seat shall be Bobrick No. B-5181 or approved equal.
J. Shower Curtains and Rods: White opaque 0.2 mm thick vinyl curtain equal to Bobrick B-204-3 (84" x 70” W) and B-204-2 (84” H x 42" W), with stainless steel hooks B-204-1 on 1-1/4" dia. extra heavy duty stainless steel rod and mounting brackets B-6047 Series curtain rod. Provide custom 84” length.
K. Sanitary Napkin Disposal: Bobrick B-254 Classis Series Surface Mounted Sanitary Napkin Disposal.
L. Baby Changing Station: Koala Kare KB310-SSRE Horizontal Stainless Steel Recessed – Mounted.
M. Adult Changing Station: Koala KareKB3000-AHL Adult Changing Station.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All handicapped bathroom fixtures and toilet accessories shall comply with all federal, state and local Handicapped code requirements and comply with ADA mounting locations and heights.

3.02 INSPECTION

A. Inspect blocking and plate inserts in framing to determine if material is in proper position for installation of accessories prior to wallboard surfacing being applied. Units securely attached to framing. Grab bars installed to withstand a 900 lb. loading condition; provide necessary concealed anchorage devices to meet load requirements.

END OF SECTION 10 28 13

SECTION 10-4000 – SAFETY SPECIALTIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 DESCRIPTION OF WORK

A. Definition: "Fire extinguisher" as used in this section refers to units which can be hand-carried as opposed to those which are equipped with wheels or to fixed fire extinguishing systems.
B. Types of products required include:
   1. Fire extinguishers.
   2. Fire extinguisher cabinets.
   3. Fire extinguisher brackets.
   4. Fire sprinkler valve and hose cabinets.
   5. Floor safes.
   6. Fire Department Key Vaults (Knox boxes).
   7. Wall signs for fire extinguishers.
C. Related Sections include the following:
   1. Division 01 - Section "Temporary Facilities and Controls", for temporary fire department access locks.
   2. Division 04 - Section "Unit Masonry Assemblies", for coordination of block-outs in masonry walls.
   3. Division 06 - Section "Rough Carpentry", for coordination of blocking in walls.
   4. Division 06 - Section "Architectural Woodwork", for wood base cabinets installed under surface mounted AED cabinets.
   5. Division 07 - Section "Joint Sealants".
   6. Division 09 - Section "Gypsum Board Assemblies".
   7. Division 21, for coordination with fire sprinkler system design.
   8. Division 26, for coordination of pathway for Knox Box security system connection.
   9. Division 28, for coordination of security system connection to Knox Box tamper switch.

1.03 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain products in this section from one manufacturer.
B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

1.04 SUBMITTALS

A. Submittal shall include manufacturer's product literature, both pictorial and written.

PART 2 - PRODUCTS

2.01 PORTABLE TYPE FIRE EXTINGUISHERS

A. Manufacturers: Design is based on products as manufactured by Activar / J.L. Industries, Inc. or Larsen's Manufacturing Co. Subject to compliance with requirements, provide the named products, or approved equal by another manufacturer.

B. Multi-purpose Class ABC Fire Extinguishers: Provide all extinguisher cabinets with ABC type extinguishers unless otherwise noted. ABC Fire extinguishers shall be a multi-purpose dry chemical type, enameled metal containers with pressure indicating gauges, rated for Class A, B, and C fires.
   1. At Fire Extinguisher Cabinets, and commercial kitchen areas mounted on brackets, provide 10 lb extinguishers, 4A-80BC rated, equal to the following:
      a. J. L. Industries Model Cosmic 10E, with MB846A bracket at bracket mounted locations.
      b. Larsen's Model MP10 with nozzle, with B-2 bracket at bracket mounted locations.
   2. At Lawn Storage, and other small flammables liquid storage areas, provide 5 lb extinguishers mounted on brackets, 3A-40BC rated, equal to the following:
      a. J.L. Industries Model Cosmic 5E, with MB818 bracket at non-storage applications and standard bracket in storage rooms.
      b. Larsen's Model MP5-A with nozzle, with 821 bracket at non-storage applications, and standard bracket in storage rooms.
   3. Where locations for specified extinguishers are not indicated in Drawings, confirm exact locations with Architect.

C. Class K, Kitchen Fire Extinguishers: Provide (1) extinguisher on bracket mount at each kitchen area equal to J.L. Industries Saturn 15, or Larsen's WC 6L, wall-mounted, wet chemical type, K class rated, 1.8 gallon capacity fire extinguishers.
   1. Bracket: J.L. Industries MB810C, or equal.

D. Fire Extinguisher Cabinets: Provide semi-recessed, one-piece steel cabinet with stainless steel finish with rolled–edge trim. Semi-recessed cabinets shall not project more than 4" from face of wall, and overall depth sized to fit specified fire extinguishers. Provide recessed handle where 4" projection of the cabinet is required. Top of rough opening for unit shall be at 54"above finished floor surface, unless otherwise dictated by governing authority. Cabinets shall be J.L. Industries Cosmopolitan series, Larsen's Architectural series, or approved equal.
   1. Semi-recessed at typical stud construction: Designed to recess into 3-5/8" stud wall construction (nominal 4" recessed).
   2. Semi-recessed at typical double stud wall and CMU construction:
   3. Finish: Stainless Steel
   4. Door Style: Vertical Duo (tall, narrow light)
   5. Glazing: Clear Acrylic

E. Wall Signs:
   1. Provide wall signs above fire extinguishers, equal to J.L. Industries 4"x12" flush plastic fire extinguisher sign #25S. Mount bottom of sign at 7'-6" unless otherwise indicated.
   2. Provide wall signs above fire extinguishers in corridors, equal to J.L. Industries 4"x18" plastic "Tent Fire Extinguisher", model 23S. Mount signs centered above extinguisher cabinets with bottom of sign at 7'-6" unless otherwise indicated.

F. Fire Department Key Vault for Building access: Provide equal to Knox “Knox-Vault 4400 Series” single lock model, recessed mount with recessed mounting kit. Provide all hardware and accessories as required for complete, secure mounting and installation at wall construction indicated.
   1. Finish: Dark Bronze.

G. Fire Department Key Vault at Gates, Grilles, and exterior site and parking lot access: Provide at each required access site point, equal to Knox "Knox Box 3200 Series" hinged door model. Surface mount to 5"x5" galvanized post, 5' tall and set 2' deep into 16" x 3' deep concrete footing, unless otherwise indicated in Drawings.
   1. Finish: Dark Bronze.
   2. Interior switches: Provide at electrically operated gates, grilles, and similar access control devices, wired below grade back to control equipment.

H. Security Safe: Provide (1) equal to Rolland Model MS-2K as manufactured by Rolland or approved equal.
   1. Dimensions: 8” H x 6” W x 12” D.
   2. Weight: 20lbs.
I. Anchors: Provide non-corrosive types as required by wall conditions.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install items included in this section in location and at mounting height indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities as directed by local fire marshal.
B. Securely fasten mounting brackets to structure, square and plumb, to comply with manufacturer's instructions.
C. Fire Department Key Vault: At key vaults located on exterior building walls, wire tamper switch to building security system as shown in Drawings or specified elsewhere. Or where security system is not part of project scope or not indicated for key vault to be wired to security system, provide empty conduit with pull wire to above nearest accessible ceiling for future security system connection.
D. Remove protective plastic sheets prior to Architect's inspection for substantial completion.

END OF SECTION 10 40 00

SECTION 10-5143 – TURNOUT GEAR LOCKERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Provide and install turnout gear lockers units as shown on the drawings and as herein specified.
B. Related Sections include the following:
   1. Division 4, Section “Unit Masonry Assemblies”.

1.03 PRODUCT DELIVERY AND STORAGE

A. Deliver all products to job site in manufacturer’s original, standard containers with seals unbroken and labels intact. Store in clean, dry area. Handle and protect materials and finishes to prevent damage.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer’s product literature for all products specified.
B. Shop Drawings: Submit shop drawings for each run of lockers. Indicate attachments to substrates and coordination with project dimensions and conditions.
C. Samples: Submit manufacturer's standard color samples.

1.05 WARRANTY

A. Manufacturer's standard limited warranty.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Turnout Gear Lockers: Provide storage units equal to "Geargrid Wall Mount Lockers" as manufactured by Gear Grid, (888) 643-6694, www.geargrid.com, or approved equal.
   1. Lockers: Wall-mount.
      a. Width: 24" nominal
      b. Depth 24" nominal
      c. Height 74" nominal (wall mounted)
      d. Frame: High strength ASTM A513 1-1/4" diameter x 16 gauge steel tubing
      e. Panel Construction: Sides and backs of high strength ASTM A510 cold drawn 1/4" diameter wire resistance welded in 3" square pattern.
         1) Two full width shelves per unit, located at top and bottom, constructed of high strength 1/4" wire.
         2) Number / Name Plates on top shelf: 20 gauge steel, to accept printed tags.
      f. Accessories:
         1) Apparel Hooks: (3) .25" diameter wire hooks per locker.

2) Rod and Hangers: Provide each locker unit with one full width hanging rod with the following hangers:
   a) Three heavy duty hangers.
   b) One Heavy Duty Gear Dryer hanger, designed to hold gear jackets open to allow faster drying.
   c) One Gloves hanger, designed to hold one pair of gloves and to allow faster drying.
3) Helmet holders: mounted to top shelf.
4) Top-side Storage: Provide top shelf over lockers matching panel construction
5) Low Shelf: Provide an assitional low wire shelf allowing bag storage on bottom shelf and boots above (additional shelf located just below jacket hanging height).

g. Mounting Brackets: 11 gauge steel

B. Finish: All components excluding assembly and mounting hardware and stainless steel components to receive high grade durable powder coat enamel finish.
   1. Gear Lockers Color: Red

PART 3 - EXECUTION

3.01 INSPECTION AND ADJUSTMENT

A. Examine units for damage. Do not install damaged units.
B. Examine all surfaces receiving gear storage units for any defects that would impair installation and if any are found, make such corrections as necessary.

3.02 INSTALLATION

A. Assemble and install units using manufacturer's standard recommended methods. Use manufacturer's standard hardware for assembly and mount units securely to substrated indicated using hardware recommended by Manufacturer.
B. Ensure lockers are installed above top of resilient base, unless noted otherwise.

3.03 PROTECTION AND CLEANING

A. Clean exposed surfaces.
B. Protection: Installer shall advise General Contractor of final protection and maintenance conditions necessary to ensure that work will be without damage at time of acceptance.

END OF SECTION 10 51 43

SECTION 10-8216 – TORNADO-RESISTANT LOUVERED SCREENS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes:
   1. Provide above-parapet building-supported louvered screenwall, as indicated on the drawings.
B. Related Documents: The Contract Documents, as defined in Division 1 Section - Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.
C. Related Sections include the following:
   1. Division 04 Section: Unit Masonry Assemblies.
   2. Division 05 Section: Structural Steel.
   3. Division 05 Section: Metal Fabrications, for miscellaneous steel, gate frames and hardware, and field welding requirements.

1.03 PERFORMANCE REQUIREMENTS

A. Louvered Screens shall be product and design tested to meet or exceed FEMA P-361 specifications for tornado safe wind and impact resistance, and ICC-500.
   1. Minimum wind speed resistance: 250 miles per hour.
   2. Minimum impact resistance: 15 lb 2x4 at initial velocity 100 MPH (minimum 67 MPH impact velocity).
B. Louvered screen shall be sight-proof design, with 50% design open area.
C. Delegated Design: Design welded attachment to support structure to meet or exceed wind loading and impact resistance for louvered screens. Additionally, see notes in Structural Drawings for design wind pressures.
   1. See Drawings for steel support structure design. Contractor is not responsible for design of steel support structure, only for attachments. Attachments should be designed so that louver would fail under wind load and impact before failure of attachments.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for required products, including finishes.
B. Shop Drawings: Submit shop drawings for fabrication and erection of louver units and accessories. Indicate coordination of fabrication dimensions with steel support structure and gate frames. Include plans, elevations and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery and other information to determine compliance with specified requirements.
C. Samples for Selection: Submit Manufacturer's accurate color rendition selector materials for complete line of premium and standard color samples (24 colors minimum) for selection by Architect.
D. Informational Submittals: Test reports, verifying performance requirements.

1.05 STORAGE AND HANDLING

A. Store louvered units under cover, out of contact with ground, and protected from damage due to construction operations. Handle louvers in manner to avoid damage to finishes. Do not drag or slide one louver over another. Do not store prefinished louvers directly on top of each other. Comply with Manufacturer's additional requirements.

1.06 QUALITY ASSURANCE

A. Field Measurements: Verify size, location and placement of louver units prior to fabrication.
B. Shop Assembly: Coordinate field measurements and shop drawings with fabrication and shop assembly to minimize field adjustments, splicing, mechanical joints and field assembly of units. Pre-assemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordination.

1.07 WARRANTY

A. Provide manufacturers 20-year Guarantee for “Kynar 500” finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available products that may be incorporated into the project include, but are not limited to, "Tornadoguard" as manufactured by Ohio Gratings, Inc., 5299 Southway St. SW, Canton Ohio 44706, (800)- 321-9800. Subject to compliance with requirements, provide the named product or comparable product by another Manufacturer.

2.02 MATERIALS

A. Horizontal Blade Louvered Screens: Stationary 6" wide, sightproof inverted vee shape carbon steel blades, 45 degree slope.
   1. Perimeter Frame: Steel C-channel.
   2. Attachment to structure: Provided steel welding plate at back side of louver units.
   3. Interior reinforcement: Vertical steel cross bars at back side of louver, sized to meet wind load and impact design criteria.
   4. Bird Screen: None.
   5. Finish: Galvanized Powder-Coat Kynar.
   6. Color(s): As selected by Architect from Manufacturer's full range.
B. Fastenings: Fasteners for exterior applications shall be hot dip galvanized or stainless steel. Clip angles or plates shall be galvanized steel.

2.03 FABRICATION

A. Provide louvers and accessories of design, materials, sizes, depth, arrangement, and metal thicknesses indicated, and as required for optimum performance with respect to strength; durability; and uniform appearance.
B. Fabricate frames to suit adjacent construction with tolerances appropriate for installation to adjoining work.
   1. Maximum variation: 1/4" in 12'.
C. Include supports, anchorage, and accessories required for complete assembly. Tap drill perimeter frame as required.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions and directions for installation. Coordinate delivery of such items to project site.

3.02 INSTALLATION

A. Locate and place louver units plumb, level and in proper alignment with adjacent work. Align top edges flush with adjacent louver units.
B. Weld louvered screens to support structure, and touch up galvanizing and finishes as required.
C. Use concealed anchorage wherever possible. Provide washers fitted to bolts where required to protect metal surfaces and to make a secure connection. Provide isolation tape as required to prevent contact of dissimilar metals.
D. Repair finishes damaged by cutting, welding, soldering and grinding operations require for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items which cannot be refinished in field to shop, make required alterations, and refinish entire unit, or provide new units, at Contractor's option.

END OF SECTION 10 82 16

SECTION 11-4205 – STAINLESS STEEL COUNTERTOPS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Provide stainless steel countertops, and splashes, as herein specified and as indicated in Drawings.
B. Related Sections:
   1. Division 06 Section "Architectural Woodwork", for coordination of countertop underlayment, and cabinet detailing.
   2. Division 07 Section “Joint Sealants”
   3. Division 11 Sections for appliances and equipment installed at or below stainless steel countertops.
   4. Division 23 for stainless steel Kitchen Hood, stainless stell back panel / plenum, and stainless steel hood extension panel (as applicable).

1.03 WORK INCLUDED

A. The work covered by this Section includes the furnishing of all labor, materials, accessories, and special services necessary to complete the Stainless Steel Countertops and integral sinks as specified herein and as shown on the Drawings.
B. The work shall include, but not be limited to, the following:
   1. The purchase and/or fabrication, delivery, unpacking and installation of all items in the correct locations and make ready for applicable final plumbing fixtures, and appliance and equipment installation, and their utility connections.

1.04 PLANS AND SPECIFICATIONS

A. Specifications and drawings have been prepared to form the basis for procurement, erection, start-up and adjustment of all equipment in this contract. Plans and specifications shall be considered as mutually explanatory and work required by one, but not by the other, shall be performed as though required by both. Items required by one, but not by the other shall be provided as though required by both. Work shall be accomplished as called for in specifications and shown on drawings, so that all items of equipment shall be completely functional for purpose for which they were designed. When there is any discrepancy between drawings and specifications, bidders should seek clarification of any discrepancies from the Architect prior to bidding.

1.05 SUBMITTALS

A. Shop Drawings: Plans shall be prepared at 1/4” to 1’-0” scale. Show size, arrangement, and details including connections to adjacent construction.
B. Product data:
   1. Stainless steel material and finish.
   2. For custom fabricated items, list name of Qualified Fabricator selected for project.

1.06 QUALITY ASSURANCE

A. All fabricated Items described in the specifications shall be manufactured by an N.S.F. qualified Foodservice Equipment Fabricator who has the plant, personnel and engineering facilities to properly design, detail and produce high quality foodservice equipment. All fabrication shall have N.S.F. labels and be by one (1) manufacturer and be of uniform design and finish.
B. The Stainless Steel Countertops Contractor shall, if requested, submit a list of at least three (3) comparably-sized projects for which the intended Foodservice Equipment Fabricator has furnished custom fabricated equipment.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Storage: Store equipment in an area convenient to the point of installation in such a way that it can be protected from the weather and job hazards.
B. Protection: Wrapping and protective coverings shall remain on all items until ready for use and in the case of stainless steel items, until installation is complete and the job is ready for cleaning.

1.08 WARRANTIES

A. Warrantee in writing all materials and fabrication against defects and workmanship for a period of one (1) year from date of acceptance.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metals and Alloys:
   1. Non-corrodible Alloy: Shall be stainless steel, Type #304, U.S. standard gauges as indicated.
      a. All exposed surfaces shall have a #4 non-directional finish.
      b. Surface finish marred by manufacture shall be ground smooth, polished and restored to match original finish.

2.02 FABRICATION AND MANUFACTURE

A. Materials and Workmanship:
   1. Unless otherwise specified or shown on drawings, all material shall be new, of best quality, perfect and without flaws. Material shall be delivered and maintained on job in an undamaged condition.
   2. Fabrication shall be equal to the standards of manufacture used by all first class equipment manufacturers, performed by qualified, efficient and skilled mechanics of the trades involved.
   3. All items of standard equipment shall be the latest model at the time of delivery.
   4. All fabricated work shall be the product of one manufacturer of uniform design, color, and finish.
B. Construction Methods:
   1. Welding: Stainless steel shall be arc welded with stainless steel electrodes. Welds shall be non-porous, free of pits and flaws, peened to remove flux and other impurities and ground smooth.
      a. Field joints necessary for delivery and assembly are to be solid welded by using the same materials and method as for shop welding. Field welded joints shall be ground smooth without dips and irregularities and finished to match original finish.
   2. Bolt, Screw and Rivet Construction:
      a. Wherever bolts are used to fasten trim to the paneling and body of equipment or to secure any exposed sheet metal surface, such bolts shall be of the concealed type.

b. Stainless steel bolts and screws of the same alloy composition, as the metal to which they are fastened shall be used.
c. Wherever threads of bolts and screws occur on the inside of fixtures and are either visible or might come in contact with a wiping cloth, such bolt or screw threads shall be capped with a stainless steel washer and stainless steel or chrome acorn cap nut.
d. If rivets are used to fasten rear paneling to the body of the fixture, such rivets shall be stainless steel. In no case shall iron rivets be used.

3. Sound deadening:
   a. Schnee Butyl-Sealant 1/2" wide rope continuously between all frame members and underside of stainless steel countertops.
   b. Tighten stud-bolts for maximum compression of sealant.

C. Stainless Steel Construction:
1. CounterTops:
   a. Metal countertops shall have all shop seams and corners welded, ground smooth and polished. All back welds to be peened and ground smooth.
   b. All working tops on closed base cabinets shall be reinforced on the underside with a framework of 1-1/2" x 4" x 1-1/2" galvanized hat channels.
   c. All countertops shall have continuous marine edges at all sides except where stainless steel back or side splashes are indicated. Provide integral backsplashes of heights indicated in Drawings.
   d. Provide integral stainless steel splashes to the same height as adjacent splashes at any adjacent walls where tile splashes are not indicated in Drawings, unless noted otherwise in Drawings. Exposed ends of splashes shall be closed.
   e. At eating bar, provide full height splash at vertical surface between countertop and eating bar top, and integral with countertop.
   f. All tops shall be reinforced so that there will not be any noticeable deflection and all reinforcements shall be stud welded to the underside of the top.
   g. No rivets or bolts to be used through tops.
   h. Field joints shall be provided in tops where necessary and are to be located for practical construction, consistent with sizes convenient for shipping and accessibility into the building.
   i. All metal tops shall be of #14 gauge stainless steel of the quality herein specified.
   j. All metal tops shall have marine edges and turned down on open sides / edges.
      1) Eating bar edge profile as shown in Drawings.
2. Trim: Trim is not an acceptable substitute for accuracy and neatness. When the Architect or Owner elects to accept a trim strip in lieu of rebuilding an item, it is the responsibility of the Stainless Steel Equipment Supplier to provide same at no cost to the Owner.

PART 3 - EXECUTION

3.01 PREPARATION

A. Coordinate requirements for plywood underlayment below stainless steel countertops, if underlayment is required, requirements for shallower drawer construction in the cabinet below the drain board, and any other provisions for installation of stainless steel countertops, with the wood cabinet fabricator, prior to preparation of the wood cabinet shop drawings.
B. Coordinate measurements and dimensions with all rough-in and space requirements. Coordinate requirements and clearances for installation of plumbing, appliances, and other equipment with stainless steel countertops, in preparation of shop drawings. Inform Architect of any apparent conflicts. Drawings are diagrammatic and intended to show layout and arrangement. Make and check all measurements again at the project site before beginning fabrication.

3.02 INSPECTION

A. Before beginning the installation, the spaces and existing conditions shall be examined by the Supplier and any discovered deficiencies or discrepancies noted shall be reported to the Architect in writing.
    1. Beginning installation shall constitute acceptance of the area.

3.03 INSTALLATION

A. Equipment shall be uncrated, fully assembled and set level in position for final connections. Parts shipped loose but required for connection shall be properly tagged and shall be accompanied by the necessary installation instructions.
B. Provide a competent, experienced foreman to supervise installation and final connections.

3.04 FIELD QUALITY CONTROL

A. Testing: After completion of final connections, thoroughly test all equipment for proper operation.
    1. Finishes marred during installation shall be repaired to the Architect’s satisfaction or replaced.

3.05 ADJUST AND CLEAN

A. Protect installed countertops and splashes from damage, scratches, etc. due to construction operations for the remainder of the construction period.
B. Upon substantial completion, remove all protective coverings and clean surfaces.
    1. Clean surfaces prior to Architect's inspection for substantial completion using products and methods that will not damage or scratch finishes, to comply with Manufacturer's and Installer's requirements.
C. Comply with Division 01, Section "Construction Waste Management".

END OF SECTION 11 42 05

SECTION 11-9000 – WASH BAY CURTAIN

PART 1 - GENERAL

1.01 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Furnish all labor, materials, tools, equipment, services, etc. necessary to complete the installation of wash bay curtain system and other items herein specified and as indicated on the drawings.

B. Section Includes:
   1. Wash Bay Curtain
   2. Curtain Track

C. Related Requirements:
   1. Section 061000 Rough Carpentry for framing.

1.03 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

A. Product Data: Catalogs shall contain data sheets, in proper order, on all equipment proposed with part or model number clearly indicated. Provide a complete list of proposed equipment with reference to its corresponding specification section/paragraph number or equipment title. Denote all deviations from specified equipment on the list.
   1. Tracks: Capability of each track to support the weight and operation of curtains that it supports.

B. Submit Manufacturer's Product Safety Data Sheets for each product.

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
   1. Include plans, elevations, sections, and attachment details of curtains.

1.05 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranty.

1.06 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wash bay curtains and rigging to include in operation and maintenance manuals.

1.07 WARRANTY

A. Manufacturer's Special Warranties:
   1. Curtain Track: Lifetime warranty.
   2. Wash Bay Curtain: 5 year warranty on manufacturer defects.

PART 2 - PRODUCTS

2.01 STAGE-CURTAIN SYSTEMS

A. Description: Complete wash bay curtain systems, including curtain, tracks, with necessary accessories for support and operation.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Akon Curtains

B. Source Limitations: Obtain wash bay curtain systems from single manufacturer.

C. Basis of Design:
   1. Wash Bay Curtain
      a. Dimensions: 82’ width, 19’-9” tall, straight curtain
      b. Material:
         1) Bottom: 18 oz Vinyl – scrim reinforced
            a) 3’ tall - Red
         2) Top: 20 mil PVC – double polished
            a) Clear
      c. Curtain Features:
         1) Chain Weight Pocket
         2) Curtain Sections – Velcro together
         3) Fire Retardant
      d. Floor Sweep
         1) Replaceable Velcro attachment at the bottom of the curtain
         2) Hangs 6” below curtain
         3) Color: Standard Black
      e. Hardware:
         1) Curtain Track
            a) Style: Trolley – Curtain rolls from side-to-side
            b) Construction – galvanized steel, 16 gauge
            c) Straight Curtain Track
            d) Ceiling Mount Track Supports
            e) Nylon Roller Curtain Hooks – 1”
            f) Track End Stops

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for supporting members, blocking, installation tolerances, clearances, and other conditions affecting performance of wash bay curtain work.

B. Examine inserts, clips, blocking, or other supports required to be installed by others to support tracks.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

A. Install wash bay curtain system according to curtain manufacturer's written instructions.

3.03 TRACK INSTALLATION

A. Ceiling-Mounted Track: Drill track at intervals not greater than manufacturer's written instructions for spacing, and fasten directly to structure.

3.04 CURTAIN INSTALLATION

A. Track Hung: Secure curtains to track carriers with nylon roller curtain hooks.

3.05 CLEANING OF THE SITE

A. Remove from the site all rubbish, trash, discarded packing materials, cartons, and other debris caused by daily operations. Upon completion of work,

END OF SECTION 11 9000

SECTION 12-2401 – MANUAL ROLLER SHADES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation

1.02 SUMMARY

A. This section includes integrated motor control options for the following:
   1. Manual Roller Solar Shades
B. Related Sections include the following:
   1. Division 6 Section “Rough Carpentry” for window shade bracket support blocking or pocket assemblies.

1.03 PERFORMANCE REQUIREMENTS

A. Fire: Provide shade fabrics tested in accordance with:
   1. 1989 NFPA 701 small scale Vertical Burn Test and rated “PASS”
   2. 1996 NFPA 701 small scale Vertical Burn (telephone booth test) and rated “PASS”
B. Anti-microbial:
   1. ASTM G-21-85 results for ATCC9642, ATCC9348 and ATCC9645 indicating “No Growth”.

1.04 SUBMITTALS

A. Specification Conformance Document: Indicate whether the submitted equipment deviates from the specific requirements:
   1. Address or itemize compliance, or detail the alternate means submitted and indicate specific methodology used for Architect review & approval.
B. Product Data: Manufacturer's data sheets with performance specifications demonstrating compliance with specified requirements, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Submit manufacturer’s descriptive literature and details for each product type specified. Details indicate materials, finishes, construction, and dimensions of individual components, profiles, and mounting requirements.
   4. Submit test reports indicating compliance with fabric properties specified.
C. Shop Drawings; include:
   1. Provide head, jamb and sill details, and relevant dimensions for mounting requirements for each product type and mounting condition.
   2. Provide shade schedule indicating room number, opening size(s), quantities and key to details.
D. Selection Samples: For each finish product specified provide:
   1. Shade fabric swatches for verification purposes of fabric as indicated for color and texture specified.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications:
    1. The manufacturer, subsidiary, or licensed agent will be qualified to supply the products specified and to honor any claims against the product presented in accordance with the warranty.
B. Installer Qualifications: Installer shall be qualified to install and commission the specified products by prior factory training, experience, demonstrated performance, and acceptance of any requirement of the manufacturer, subsidiary of the manufacturer, or licensed agent.
C. Do not fabricate shades without obtaining field dimensions for each opening. Coordinate construction of surrounding conditions to allow for timely field dimension verification.
D. Compliance with safety regulations including ANSI/WCMA A100.1

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver items to the project until all plaster, painting and other wet work has been completed and is dry.
B. Deliver shades to project in labeled protective packaging, uniquely labeled to identify each shade for each opening. Schedule delivery to prevent delays to completion of work but to minimize on-site storage time.
C. Store materials in a dry, secure place. Protect from weather, surface contaminants, corrosion, construction traffic and all other potential damage.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions within recommended limits:
    1. Ambient operating temperature: 32–72 °F
    2. Humidity: 0–90%, non-condensing.
    3. Do not install products under environmental conditions outside manufacturer's absolute limits.
    4. Products are intended for Indoor use only.
B. Shade system shall not be installed until the building is operating at ambient temperature and humidity ranges that are consistent with those intended for eventual building occupancy & use.

1.08 COORDINATION

A. Scheduling:
    1. Fabricate shades after obtaining field dimensions for each opening.
    2. Coordinate construction of surrounding conditions to allow for timely field dimension verification.
    3. Manufacturer’s standard lead times apply. Reference submittal and schedule accordingly for project timeline.

1.09 WARRANTY

A. Hardware and Shadecloth and all other components of manual shade system are Warranted for 25 years.
B. In the event of a warranted product failure, the Shade Contractor will, at no cost to Owner, facilitate acquisition and delivery of all necessary components to the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Clutch-Operated Flex-Shade NEXD provided by Draper. (Single Roller and Dual Roller)
    Draper, Inc., 411 South Pearl St., P.O. Box 425, Spiceland, IN 47385
    (800) 238-7999

B. Substitutions: Under provisions of Division 1.
   1. All proposed substitutions must be clearly delineated, and must be submitted in writing for approval by Architect a minimum of 10 working days prior to the bid date, and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.

2.02 MANUALLY OPERATED WINDOW SHADES

A. Manually Operated Dual Roller Window Shades
   1. Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation; Clutch-operated Dual Roller FlexShade as manufactured by Draper, Inc.
   2. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.
      (a) Bead chain loop: Stainless steel bead chain.
   3. Dual-Roller Configuration:
      a. Mounting:
         1) Dual roller endcaps. Endcaps for surface or recessed mounting of dual roller window shades. 1028 steel stamping.
            (a) Idler endcap to have optional levelling adjustment.
         2) Dual roller fascia. Endcaps with fascia designed for surface mounting of dual roller window shades.
            (a) Endcaps: 1028 steel stamping.
               (1) Idler endcap to have optional levelling adjustment.
            (b) Fascia: L-shaped cover of extruded aluminum, .060 wall. Assembly snaps onto endcaps without exposed fasteners.
            (c) Size: Determined by manufacturer based on fabric size, weight, and thickness and window opening size.
            (d) Finish: Powder coat.
               (1) Selected from Manufacturers standard range
               (2) Custom powder coat as selected by the Architect
         3) Dual roller with ceiling/wall headbox. Fascia, L-shaped top/back, and endcaps designed for wall or ceiling installation of dual roller window shades.
            (a) Endcaps: 1028 steel stamping.
               (1) Idler endcap to have optional levelling adjustment.
            (b) Fascia: L-shaped cover of extruded aluminum, .060 wall. Assembly snaps onto endcaps without exposed fasteners.
            (c) Size: Determined by manufacturer based on fabric size, weight, and thickness and window opening size.
            (d) Finish: Powder coat.
               (1) Selected from Manufacturers standard range.
               (2) Custom powder coat as selected by the Architect.
   4. Roller Tube: Fabricated from extruded aluminum, galvanized steel, or enameled steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade type and size. Minimum roller diameter 1.5 inches. Tube diameters less than 1.5 inches shall not be acceptable unless manufacturer provides deflection analysis showing deflection limited to <= width(inches)/700 at 1.5X design load.
   5. Fabric to tube attachments: LSE (low surface energy) double sided adhesive specifically developed to attach coated textiles to metal. Adhesive attachment to eliminate horizontal impressions in fabric.
   6. Shade slat:
      a. Closed pocket elliptical slat: 1 inch (25 mm) aluminum elliptical slat inside of a 1-5/8 inch (41 mm) pocket with heat sealed ends.

7. Light Gap Reduction Channels.
   a. U Channel -1 inch (25 mm) by 2-1/2 inches (64 mm).

B. Manually Operated Single Roller Window Shades
   1. Heavy-Duty Manually Operated Window Shades with Independent Control: Manually operated, vertical roll-up, fabric window shade with components necessary for complete installation; Clutch-Operated FlexShade® NEXD as manufactured by Draper, Inc.
   2. Operation: Bead chain and clutch operating mechanism allowing shade to stop when chain is released. Designed never to need adjustment or lubrication. Provide limit stops to prevent shade from being raised or lowered too far.
      a. Bead chain loop: Stainless steel bead chain.
   3. Single Roller Configuration:
      a. Mounting:
         1) Endcaps and fascia.
      b. Endcaps: 1018 stamped steel. Suitable for mounting to ceiling, wall, and jamb. Height adjustable idler end allows fine leveling adjustments after installation. Field adjustable from ceiling to wall. No “L” angle required for wall mounting. Contains at least two entry points for the idler end.
         1) Endcap covers: To match fascia or headbox color.
      c. Fascia: L shaped aluminum extrusion to conceal shade roller and hardware.
         1) Attachment: Snaps onto endcaps without requiring exposed fasteners of any kind. Fascia can be mounted continuously across two or more shade bands. No notching is required.
            a) Finish: Black powder coat.
      d. Shade slat:
         1) Closed pocket elliptical slat: 1 inch (25 mm) aluminum elliptical slat inside of a 1-5/8 inch (41 mm) pocket with heat sealed ends.
      e. Light Gap Reduction Channels.
         1) U Channel -1 inch (25 mm) by 2-1/2 inches (64 mm).

2.03 OPAQUE WINDOW SHADE SYSTEM

B. Operation Type: Bead chain and clutch operated, vertical roll-up, fabric, opaque window shade system, complete with headbox, side and sill channels for total opacity; LightBloc FlexShade® System as manufactured by Draper, Inc.

C. Roller Tube: Fabricated from extruded aluminum, galvanized steel, or enameled steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade type and size. Fabric connected to the roller tube with LSE (low surface energy) double sided adhesive specifically developed to attach coated textiles to metal. Adhesive attachment to eliminate horizontal impressions in fabric.

D. Headbox: Consists of extruded aluminum sections with endcaps and opacity plates.
   1. Size: 4-1/8 inches (105 mm) high by 3-1/2 inches (89 mm) wide by length required for shade being provided.
   2. L-shaped removable front face and bottom cover and L-shaped back and top.

E. Endcaps: Stamped steel with universal design suitable for mounting to ceiling, wall, and jamb. Provide size compatible with roller size.

F. Side Channels: Double chamber fabricated from 0.06 inch (1.5 mm) thick extruded aluminum sections. One chamber accepts fabric and contains groove for fabric retainer. Other chamber accepts fabric guide and channel locator.

G. Sill channel: 0.06 inch (1.5 mm) thick extruded aluminum channel to receive slat bar and prevent light leakage.

H. Slat bar: Extruded aluminum bar attached to bottom of shade. Bar does not retract into headbox.

I. Channel locator: Injected molded nylon insert to align side and sill channels with headbox.

J. Fabric guide: Plated steel transition for fabric rolling into side channel.

K. Fabric retainer: System designed to prevent disengagement of fabric from side channels due to normal variations of air pressure caused by doors opening, HVAC systems, and temperature differences between room and window well. System consists of horizontal steel stays installed in shade, covered with fabric, and spaced at regular intervals. Grommets installed through stays are held within groove of side channel chamber.

L. Exposed aluminum finish:
   1. Finish: Black.

2.04 SYSTEM REQUIREMENTS

A. Aesthetics
   1. Symmetrical light gaps of no more than 0.75 inch typical or 0.625 inch minimum.
   2. Shade mounting position can be adjusted while the shade is installed to ensure perfect shade centering

2.05 ROLLER SHADE

A. Fabrics:
   1. Fabric #1
      a. Sheer Shade 3%:
         1) SheerWeave® Series PW4400 by Phifer®: Vinyl coated polyester yarn woven into basketweave pattern. Uses DOW ECOLIBRIUM™ bio-based, phthalate-free plasticizer. Fire rating: California U.S. Title 19 (small scale), NFPA 701 TM#1 (small scale), NFPA 101 (Class A Rating), IBC Section 803.1.1 (Class A Rating), BS 5867 Part 2 Type B Performance, NFPA 701 TM#2 (large scale), CAN/ULC-S 109 (large and small scale), CAN/CGSB2-4.162-M80. Bacteria and fungal resistance: ASTM E 2180, ASTM G21, ASTM G22, AATCC30 Part 3, ASTM D 3273, GREENGUARD® Mold and Bacteria Standard ASTM 6329; includes Microban® antimicrobial additives. Environmental Certification: Certified to GREENGUARD and GREENGUARD Gold® standards for low chemical emissions into indoor air during product usage. Safe use: RoHS/Directive 2002/95/EC, US Consumer Product Safety Commission Section 101 and ANSI/WCMA A 100.1-2007 for lead content, REACH (EC 1907/2006) compliant. Average 3 percent open, 20.7 oz/sq yd, .037 inches thick.
         2) Color: U65 Eco / Ebony
   2. Fabric #2
      a. Blackout, Value Premiere, "Sand”.
         1) SheerWeave® Series SW7100 Blackout by Phifer®: PVC-coated Fiberglass laminated with a 2-ply PVC film. Fire rating: NFPA 701 TM#1 (small scale), NFPA 701 TM#2 (large scale), BS 5867 Part 2 Type B Performance, CAN/ULC-S 109 (large and small scale), NFPA 101 (Class B Rating), IBC Section 803.1.1 (Class B Rating). Bacteria and fungal resistance: ASTM E 2180, ASTM G21, ASTM G22, AATCC30 Part 3, ASTM D 3273, GREENGUARD® Mold and Bacteria Standard ASTM 6329; Style 2000 face

includes Microban® antimicrobial additives. Environmental certification: Certified to GREENGUARD and GREENGUARD Gold® standards for low chemical emissions into indoor air during product usage. Safe Use: RoHS/Directive 2002/95/EC, US Consumer Product Safety Commission Section 101, ANSI/WCMA A 100.1-2007 for lead content and REACH (EC 1907/2006) compliant. Opaque, .025 inches thick, 21.6 oz/square yard, opaque.

2) Color: V21 Charcoal

2.06 ROLLER SHADE SCHEDULE

A. Roller Shade Schedule: Refer to the Drawings for locations.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Begin installation after substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install shades in windows level and plumb to provide smooth operation.
C. Install in accordance with manufacturer’s product data and approved shop drawings.
D. A factory-qualified technician shall perform field measurement and installation.

3.04 ADJUSTING

A. Adjust the level, projection, and shade centering directly from mounting bracket.
B. Adjust fabric on tube if visibly telescoping.

3.05 CLEANING

A. Touch up damaged finishes and repair minor damage in order to eliminate evidence of repair. Remove and replace work that cannot be satisfactorily repaired.
B. Clean exposed surfaces, including metal and shade fabric, using non-abrasive materials and methods recommended by the shade fabric manufacturer. Remove and replace work that cannot be satisfactorily cleaned.

3.06 DEMONSTRATION

A. Demonstrate operation method and instruct owner's personnel in the proper operation and maintenance of the window shade systems.
B. Manufacturer’s Instructions:
   1. Installation and Maintenance instructions to be included in product packaging.
   2. 24-Hour / 7-Day Factory Technical Support shall be available to aid with unforeseen installation difficulties.

3.07 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion

END OF SECTION 12 24 00

SECTION 21-0500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Above ground piping.
B. Escutcheons.
C. Mechanical couplings.
D. Pipe hangers and supports.
E. Pipe sleeves.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.
C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
D. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.
B. Provide temporary protective coating on cast iron and steel valves.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Sprinkler-based System:
   1. Comply with NFPA 13.
   2. See Section 21-1300.
B. Welding Materials and Procedures: Comply with ASME BPVC-IX.
C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A795 Schedule 10 or ASTM A795 Schedule 40, black.
   1. Steel Fittings: ASME B16.5 steel flanges and fittings.
   2. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
   3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.03 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
   4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
B. Clearances:

1. Provide allowance for insulated piping.
2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
3. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 07-8400 to prevent the spread of fire, smoke, and gases.

2.04 ESCUTCHEONS

A. Manufacturers:
   1. Fire Protection Products, Inc: www.fppi.com/#sle.com/#sle.
   2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
   3. Viking Group Inc: www.vikinggroupinc.com/#sle.
B. Material:
   1. Fabricate from nonferrous metal.
   2. Chrome-plated.
   3. Metals and Finish: Comply with ASME A112.18.1.
C. Construction:
   1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
   2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.05 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
   1. Manufacturers:
      a. AFCON, a brand of Anvil International: www.anvilintl.com/#sle.
      b. FNW: www.fnw.com/#sle.
B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
   1. Manufacturers:
      a. AFCON, a brand of Anvil International: www.anvilintl.com/#sle.
      b. FNW: www.fnw.com/#sle.
C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
F. Vertical Support: Steel riser clamp.

2.06 MECHANICAL COUPLINGS

A. Manufacturers:
   1. Anvil International: www.anvilintl.com/#sle.
   2. Shurjoint Piping Products, Inc: www.shurjoint.com/#sle.
   3. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
   4. Victaulic Company; FireLock Style 009H: www.victaulic.com/#sle.
B. Rigid Mechanical Couplings for Grooved Joints:
   1. Dimensions and Testing: Comply with AWWA C606.
   2. Minimum Working Pressure: 300 psig.
   3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
   4. Housing Coating: Factory applied orange enamel.

5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
B. Remove scale and foreign material, from inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
C. Install piping to conserve building space, to not interfere with use of space and other work.
D. Group piping whenever practical at common elevations.
E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
F. Pipe Hangers and Supports:
    1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
    2. Place hangers within 12 inches of each horizontal elbow.
    3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
    4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
    5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
I. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
    1. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 07-8400 to prevent the spread of fire, smoke, and gases.
    2. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
J. Escutcheons:
    1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
    2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
    3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

K. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 21-0523 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Two-piece ball valves with indicators.
B. Bronze butterfly valves with indicators.
C. Iron butterfly valves with indicators.
D. Check valves.
E. Bronze OS&Y gate valves.
F. Iron OS&Y gate valves.
G. NRS gate valves.
H. Indicator posts.
I. Trim and drain valves.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, and weld ends.
   3. Set valves open to minimize exposure of functional surfaces.
B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors and maintain at higher than ambient dew point temperature.
      b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.
C. Use the following precautions for handling:
   1. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. UL Listed: Provide valves listed in UL (DIR) under following headings and bearing UL mark:
   1. Main Level: HAMV - Fire Main Equipment.
      a. Level 1: HCBZ - Indicator Posts, Gate Valve.
      b. Level 1: HLOT - Valves.
      c. Level 3: HLUG - Ball Valves, System Control.

d. Level 3: HLXS - Butterfly Valves.
e. Level 3: HMER - Check Valves.
f. Level 3: HMRZ - Gate Valves.

B. ASME Compliance:
1. ASME B16.1 for flanges on iron valves.
2. ASME B1.20.1 for threads on threaded-end valves.
3. ASME B31.9 for building services piping valves.

C. Comply with AWWA C606 for grooved-end connections.

D. Comply with NFPA 13 for valves.

E. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

2.02 TWO-PIECE BALL VALVES WITH INDICATORS

A. Description:
1. Minimum Pressure Rating: 175 psig.
2. Body Design: Two piece.
3. Body Material: Forged brass or bronze.
4. Port Size: Full or standard.
5. Seat: PTFE.
6. Stem: Bronze or stainless steel.
7. Ball: Chrome-plated brass.
8. Actuator: Worm gear or traveling nut.

2.03 BRON□E BUTTERFLY VALVES WITH INDICATORS

A. Minimum Pressure Rating: 175 psig.

B. Body Material: Bronze.

C. Seat: EPDM.

D. Stem: Bronze or stainless steel.

E. Disc: Bronze with EPDM coating.

F. Actuator: Worm gear or traveling nut.

G. Supervisory Switch: Internal or external.

2.04 IRON BUTTERFLY VALVES WITH INDICATORS

A. Minimum Pressure Rating: 175 psig.

B. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, polyamide, or _____ coating.

C. Seat: EPDM.

D. Stem: Stainless steel.

E. Disc: Ductile iron, nickel plated.

F. Actuator: Worm gear or traveling nut.

G. Supervisory Switch: Internal or external.

H. Body Design: Grooved-end connections.

2.05 CHECK VALVES

A. Minimum Pressure Rating: 175 psig.

B. Type: Center guided check valve.

C. Body Material: Cast iron, ductile iron.
D. Center guided check with elastomeric seal.
E. Hinge Spring: Stainless steel.
F. End Connections: Flanged, grooved, or threaded.

2.06 BRON□E OS Y GATE VALVES

A. Minimum Pressure Rating: 175 psig.
B. Body and Bonnet Material: Bronze or brass.
C. Wedge: One-piece bronze or brass.
D. Wedge Seat: Bronze.
E. Stem: Bronze or brass.
F. Packing: Non-asbestos PTFE.
G. Supervisory Switch: External.
H. End Connections: Threaded.

2.07 IRON OS Y GATE VALVES

A. Maximum Working Pressure: 175 psi.
B. Body and Bonnet Material: Cast or ductile iron.
C. Wedge: Cast or ductile iron, or bronze with elastomeric coating.
D. Stem: Brass, bronze, or stainless steel.
E. Packing: Non-asbestos PTFE.
F. Supervisory Switch: External.

2.08 NRS GATE VALVES

A. Minimum Pressure Rating: 175 psig.
B. Body and Bonnet Material: Cast or ductile iron.
C. Wedge: Cast or ductile iron with elastomeric coating.
D. Stem: Brass or bronze.
E. Packing: Non-asbestos PTFE.
F. Supervisory Switch: External.
G. End Connections: Flanged.

2.09 INDICATOR POSTS

A. Type: Underground.
B. Base Barrel Material: Cast or ductile iron.
C. Cap: Cast or ductile iron.
D. Operation: Wrench.

2.10 TRIM AND DRAIN VALVES

A. Ball Valves:
    1. Description:
        a. Pressure Rating: 175 psig.
        b. Body Design: Two piece.
        c. Body Material: Forged brass or bronze.
        d. Port Size: Full or standard.

e. Seat: PTFE.
f. Stem: Bronze or stainless steel.
g. Ball: Chrome-plated brass.
h. Actuator: Hand-lever.

PART 3 EXECUTION

3.01 EXAMINATION

A. Confirm valve interior to be free of foreign matter and corrosion.
B. Remove packing materials.
C. Examine guides and seats by operating valves from the fully open position to the fully closed position.
D. Examine valve threads and mating pipe for form and cleanliness.
E. Examine mating flange faces for conditions that might cause leakage.
   1. Check bolting for proper size, length, and material.
   2. Verify gasket for size, defects, damage, and suitable material composition for service.
   3. Replace all defective valves with new valves.

3.02 INSTALLATION

A. Comply with specific valve installation requirements and application in the following Sections:
   1. Section 21-1300 for application of valves in wet and dry pipe, fire-suppression sprinkler systems.
B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.
C. Install check valve in water supply connections and backflow preventer at potable water supply connections.
D. Valves in horizontal piping installed with stem at or above the pipe center.
E. Position valves to allow full stem movement.

END OF SECTION

SECTION 21-1300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system.
B. Dry-pipe sprinkler system.
C. System design, installation, and certification.
D. Fire department connections.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
C. Shop Drawings:
    1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
    2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
    3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.
D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 01-6000 - PRODUCT REQUIREMENTS for additional provisions.
    2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
    3. Sprinkler Wrenches: For each sprinkler type.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:
    1. Anvil International: www.anvilintl.com/#sle.
    2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
    3. Viking Corporation: www.vikinggroupinc.com/#sle.

2.02 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.
B. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.03 SPRINKLERS

A. Suspended Ceiling Type: Concealed pendant type with matching push on escutcheon plate.
    1. Response Type: Quick.
    2. Coverage Type: Standard.
    3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Exposed Area Type: Pendant type with guard.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
D. Dry Sprinklers: Concealed pendant type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
E. Guards: Finish to match sprinkler finish.
F. Flexible Drop System: Stainless steel, multiple use, open gate type.
   1. Application: Use to properly locate sprinkler heads.
   2. Include all supports and bracing.
   3. Provide braided type tube as required for the application.
   4. Manufacturers:
      a. FlexHead Industries, a brand of Anvil International: www.anvilintl.com/#sle.
      b. Victaulic Company; Vic-Flex: www.victaulic.com/#sle.

2.04 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
B. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:
C. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.
D. Fire Department Connections:
   1. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.
      a. Inlets: Two way, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
      b. Configuration: Horizontal.

2.05 AIR COMPRESSOR

A. Compressor: Single-unit, electric motor driven, motor, motor starter, safety valves, check valves, air maintenance device incorporating electric pressure switch and unloader valve.

2.06 NITROGEN GENERATOR

A. Nitrogen Generator:
   1. Provide FM (AG) approved system and accessories.
B. Minimum Nitrogen Purity: 98 percent.
C. Provide piping and accessories to connect to dry fire suppression systems.

D. Accessories:
    1. Provide control panel or remote annunciator panel.
    2. Provide air maintenance device.
    3. Provide purge valves to remove oxygen from the system.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.
B. Install equipment in accordance with manufacturer's instructions.
C. Provide approved double check valve assembly at sprinkler system water source connection.
D. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.
E. Locate outside alarm gong on building wall as indicated.
F. Place pipe runs to minimize obstruction to other work.
G. Place piping in concealed spaces above finished ceilings.
H. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
I. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
J. Flush entire piping system of foreign matter.
K. Install guards on sprinklers where indicated.
L. Hydrostatically test entire system.
M. Require test be witnessed by Fire Marshal.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 22-0517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
   4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 07-8400 to prevent the spread of fire, smoke, and gases.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

E. Aboveground Piping:
   1. Pack solid using mineral fiber complying with ASTM C592.
   2. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.

F. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 07-8400 to prevent the spread of fire, smoke, and gases.

G. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

H. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.
B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 22-0519 - METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure Gauges:
   1. Bourdon tube for liquids and gases.
B. Thermometers.
C. Pressure-Temperature test plugs.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide red-marked product data sheets for each furnished item with associated components and accessories.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Manufacturers:
   1. Ashcroft, Inc: www.ashcroft.com/#sle.
   2. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.
   3. Moeller Instrument Company, Inc: www.moellerinstrument.com/#sle.
   4. Weksler Glass Thermometer Corp: www.wekslerglass.com/#sle.
   5. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
B. Bourdon Tube for Liquids and Gases:
   1. Dial Size and Cover: 4-1/2 inch diameter scale with polycarbonate window.
   2. Dial Text and Markings: Black color on white background with scaled kPa and psi units.
   3. Accuracy: ASME B40.100, adjustable commercial grade (B) with 2 percent at mid-range of span.
   4. Process Connection: Lower-back, 1/4 inch NPT male except where noted.
   5. Gauge Wetted Materials: Painted steel case and brass socket rated to match process pressure and temperature range.

2.02 THERMOMETERS

A. Manufacturers:
   1. Dwyer Instruments, Inc: www.dwyer-inst.com/#sle.
   2. Moeller Instrument Company, Inc: www.moellerinstrument.com/#sle.
   3. Watts Water Technologies, Inc: www.watts.com/#sle.
   4. Weiss Instruments, LLC: www.weissinstruments.com/#sle.
   5. Weksler Glass Thermometer Corp: www.wekslerglass.com/#sle.
   6. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
B. General:
   1. Product Compliance: ASTM E1.
   2. Lens: Clear glass, except where stated.
   3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.
   4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.

C. Thermometers - Adjustable Angle: 7 inch v-shape aluminum case with clear glass window scale, 6 inch NPT stem, red or blue organic non-toxic liquid filled glass tube, and adjustable joint with positive locking device allowing 360 degrees in horizontal plane or 180 degrees in vertical plane adjustments.

2.03 PRESSURE-TEMPERATURE TEST PLUGS:

A. Size: 500 psi capacity; 1/2 inch MPT brass fitting with gasket, cap, and retaining strap for 1/8 inch pressure gauge or temperature probe.

B. Wetted Materials per Temperature Range:

1. Up to 200 degrees F: Brass probe with neoprene core.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install pressure gauges as follows:

1. At Pumps: Place single gauge before strainer, suction side and discharge side.

B. Install thermometers as follows:

1. Hot Water Heaters: Place upstream and downstream of heater. Add one on the inlet end when using steam as the water heating medium.

END OF SECTION

SECTION 22-0523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ball valves.
B. Butterfly valves.
C. Check valves.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.03 QUALITY ASSURANCE

A. Manufacturer:
    1. Obtain valves for each valve type from single manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
    1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
    2. Protect valve parts exposed to piped medium against rust and corrosion.
    3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
    4. Secure check valves in either the closed position or open position.
    5. Adjust butterfly valves to closed or partially closed position.
B. Use the following precautions during storage:
    1. Maintain valve end protection and protect flanges and specialties from dirt.
        a. Provide temporary inlet and outlet caps.
    2. Store valves in shipping containers and maintain in place until installation.
        a. Store valves indoors in dry environment.
        b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

1.05 EXERCISE THE FOLLOWING PRECAUTIONS FOR HANDLING:

A. Handle large valves with sling, modified to avoid damage to exposed parts.
B. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).
B. Provide the following valves for the applications if not indicated on drawings:
    1. Shutoff: Ball or butterfly.
    2. Swing Check (Pump Outlet):
        a. 2 inch and Smaller: Bronze swing check valves with bronze disc.
C. Required Valve End Connections for Non-Wafer Types:
    1. Copper Tube:
        a. 2 inch and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

b. 2-1/2 inch to 4 inch: Flanged ends except where threaded valve-end option is indicated in valve schedules below.

D. Domestic, Hot and Cold Water Valves:
   1. 2 inch and Smaller:
      a. Bronze: Provide with solder-joint ends.
      b. Ball: Two piece, full port, bronze with bronze trim.
      c. Bronze Swing Check: Class 125, bronze disc.
   2. 2-1/2 inch and Larger:
      a. Iron, 2-1/2 inch to 4 inch: Provide with flanged ends.
      b. Iron Single-Flange Butterfly: 200 CWP, EPDM seat, aluminum-bronze disc.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
B. Valve Sizes: Match upstream piping unless otherwise indicated.
C. Valve Actuator Types:
   1. Hand Lever: Quarter-turn valves 6 inch and smaller.
D. Insulated Piping Valves: With 2 inch stem extensions and the following features:
   1. Gate Valves: Rising stem.
   2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
   3. Butterfly Valves: Extended neck.
   4. Memory Stops: Fully adjustable after insulation is installed.
E. Valve-End Connections:
   1. Threaded End Valves: ASME B1.20.1.
   2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
   3. Grooved End Connections: AWWA C606.
F. General ASME Compliance:
   1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
   2. Solder-joint Connections: ASME B16.18.
   3. Building Services Piping Valves: ASME B31.9.
G. Potable Water Use:
   1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
   2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.
H. Valve Bypass and Drain Connections: MSS SP-45.
I. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE, BALL VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.
B. Two Piece, Full Port with Stainless Steel Trim:
   1. Comply with MSS SP-110.
   2. WSP Rating: 150 psi.
   3. WOG Rating: 600 psi.

4. Body: Forged bronze or dezincified-brass alloy.
5. Ends Connections: Pipe thread or solder.
6. Seats: PTFE.
7. Stem: Bronze, blowout proof.
8. Ball: Chrome plated brass.
9. Manufacturers:
    a. Apollo Valves; _____: www.apollovalves.com/#sle.
    b. Milwaukee Valve Company.
    c. Victaulic.
    d. Hammond.
    e. Grinnell.
    f. Watts.
    g. Crane.
    h. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

2.04 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Lug Style; Bi-directional dead-end service without use of downstream flange:
1. Class 125 or Class 150 flanges.
2. Comply with MSS SP-67, Type I.
3. Lug Style, Service Pressure Ratings:
    a. 100 psi for sizes 14 to 24 inch.
    b. 150 psi for sizes 2 to 12 inch.
    c. Vacuum down to 29.9 in-Hg.
4. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
5. Stem: One or two-piece stainless steel.
6. Seat: EPDM.
7. Disc: Aluminum-bronze.
8. Finish: Epoxy coated.
9. Operator: Lockable handle over direct-mount actuator base.
10. Manufacturers:
    a. Apollo Valves; _____: www.apollovalves.com/#sle.
    b. Hammond Valve..
    c. Milwaukee Valve Company.
    d. Watts.
    e. Crane
    f. Victaulic
    g. Mueller
    h. Grinnell.
    i. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

2.05 BRONZE, SWING CHECK VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:
1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Horizontal or vertical flow.

3. CWP Rating: 200 psi.
4. Body: Bronze, ASTM B62.
5. End Connections: Threaded or soldered.
6. Disc: Bronze.
7. Manufacturers:
    a. Apollo Valves; _____: www.apollovalves.com/#sle.
    b. Mueller.
    c. Watts.
    d. Metraflex.
    e. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
B. Verify valve parts to be fully operational in all positions from closed to fully open.
C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
C. Install check valves where necessary to maintain direction of flow as follows:
    1. Swing Check: Install horizontal maintaining hinge pin level.
    2. Orient plate-type and center-guided into horizontal or vertical position, between flanges.

END OF SECTION

SECTION 22-0529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated trapeze-framed systems.
B. Strut systems for pipe or equipment support.
C. Beam clamps.
D. Pipe hangers.
E. Pipe rollers and roller supports.
F. Pipe supports, guides, shields, and saddles.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03-3000.

1.03 QUALITY ASSURANCE

A. Comply with applicable building code.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.
B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
C. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
D. Vibration Isolation and Seismic Restraint Requirements: See Section 22-0548.
E. Materials for Metal Fabricated Supports: Comply with Section 05-5000.
   1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
   2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
F. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

2.02 PREFABRICATED TRAPEZE-FRAMED SYSTEMS

A. Prefabricated Trapeze-Framed Metal Strut Systems:
   1. Manufacturers:
      a. Anvil International, LLC: www.asc-es.com/#sle.
      b. Custom Strut and Roll Forming, LLC: www.customstrut.com/#sle.
      c. Unistrut, a brand of Atkore International, Inc; _____: www.unistrut.com/#sle.
      d. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
   2. MFMA-4 compliant, pre-fabricated, MSS SP-58 Type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.
   3. Strut Channel or Bracket Material:
   4. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

2.03 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

A. Strut Channels:
   1. Manufacturers:
      a. ABB Installation Products: electrification.us.abb.com/#sle.
      b. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
      c. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
   2. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
   3. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
B. Hanger Rods:
   1. Threaded zinc-plated steel unless otherwise indicated.
C. Channel Nuts:
   1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

2.04 BEAM CLAMPS

A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
B. C-Clamp: MSS SP-58 type 23, malleable iron and steel with plain, stainless steel, and zinc finish.
C. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
D. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.05 PIPE HANGERS

A. Swivel Ring Hangers, Adjustable:
   1. MSS SP-58 type 10, epoxy-painted, zinc-colored.
   2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
   3. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.
B. Clevis Hangers, Adjustable:
   1. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.
   2. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

2.06 PIPE CLAMPS

A. Riser Clamps:
   1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
   2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
   3. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.

2.07 PIPE ROLLERS AND ROLLER SUPPORTS

A. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.
B. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.

2.08 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
B. Pipe Shields for Insulated Piping:
   1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
   2. General Construction and Requirements:
      a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
      b. Shields Material: UV-resistant polypropylene with glass fill.
      c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
      d. Service Temperature: Minus 40 to 178 degrees F.
      e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
C. Pipe Supports:
   1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
   2. Liquid Temperatures Up to 122 degrees F:
      a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
      b. Support From Below: MSS SP-58 types 35 through 38.
D. Pipe Supports, Thermal Insulated:
   1. General Requirements:
      a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
      b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
      c. Provide pipe supports for 1/2 to 30 inch iron pipes.
      d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
G. Secure fasteners according to manufacturer's recommended torque settings.
H. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS for additional requirements.
B. Inspect support and attachment components for damage and defects.
C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 22-0553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tags.
B. Pipe markers.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Tags:
    1. Manual operated and automated control valves.
B. Pipe Markers: 3/4 inch diameter and higher.

2.02 TAGS

A. Manufacturers:
    1. Advanced Graphic Engraving: www.advancedgraphicengraving.com/#sle.
    2. Brady Corporation: www.bradycorp.com/#sle.
    3. Brimar Industries, Inc: www.pipemarker.com/#sle.
    4. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
    5. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
    6. Seton Identification Products: www.seton.com/#sle.
    7. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
B. Metal: Brass, 19 gauge 1-1/2 inch in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

2.03 PIPE MARKERS

A. Manufacturers:
    1. Brady Corporation: www.bradycorp.com/#sle.
    2. Brimar Industries, Inc: www.pipemarker.com/#sle.
    3. Craftmark Pipe Markers: www.craftmarkid.com/#sle.
    4. Kolbi Pipe Marker Co: www.kolbipipemarkers.com/#sle.
    5. Seton Identification Products: www.seton.com/#sle.
    6. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
B. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.
C. Identification Scheme, ASME A13.1:
    1. Primary: External Pipe Diameter, Uninsulated or Insulated.
    2. Secondary: Color scheme per fluid service.
        a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

A. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

B. Apply ASME A13.1 Pipe Marking Rules:

1. Place pipe marker adjacent to changes in direction.
2. Place pipe marker adjacent each valve port and flange end.
3. Place pipe marker at both sides of floor and wall penetrations.
4. Place pipe marker every 25 to 50 feet interval of straight run.

END OF SECTION

SECTION 22-0719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass fiber insulation.
B. Jacketing and accessories.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.04 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.
B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER INSULATION

A. Manufacturers:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Johns Manville Corporation: www.jm.com/#sle.
   3. Knauf Insulation: www.knaufinsulation.com/#sle.
   4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
   5. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 650 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.
C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm.
D. Vapor Barrier Lap Adhesive: Compatible with insulation.
E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.03 JACKETING AND ACCESSORIES

A. PVC Plastic Jacket:
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
d. Thickness: 10 mil, 0.010 inch.
e. Connections: Brush on welding adhesive.

2. Covering Adhesive Mastic: Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.
B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Exposed Piping: Locate insulation and cover seams in least visible locations.
C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
D. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
F. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
G. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07-8400.
I. Pipe Exposed in Mechanical Equipment Rooms, Finished Spaces, or in apparatus bays (less than 10 feet above finished floor):

3.03 SCHEDULES

A. Plumbing Systems:

1. Domestic Hot Water and Recirculated Water:
    a. Glass Fiber Insulation:
        1) Pipe Size Range: Up to 1-1/2 Inch
            (a) Thickness: 1 Inch
        2) Pipe Size Range: 2 Inch and Larger
            (a) Thickness: 1.5 Inch
2. Domestic Cold Water:
    a. Glass Fiber Insulation:
    b. Pipe Size Range: 1 inch and smaller.
            (a) Thickness: 1/2 inch.
    c. Pipe Size Range: 1-1/4 inch and larger.
            (a) Thickness: 1 inch.

END OF SECTION

SECTION 22-1005 - PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary waste piping, buried within 5 feet of building.
B. Sanitary waste piping, above grade.
C. Domestic water piping, buried within 5 feet of building.
D. Domestic water piping, above grade.
E. Pipe flanges, unions, and couplings.
F. Pipe hangers and supports.

1.02 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
B. Provide temporary protective coating on cast iron and steel valves.
C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.04 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
B. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.
C. PVC Pipe, Solid-wall: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: Cast iron.
   2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
B. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. PVC Pipe, Solid-wall: ASTM D2665.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.
   3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.
      a. Manufacturers:
         1) Anvil International: www.anvilintl.com/#sle.
         2) Apollo Valves: www.apollovalves.com/#sle.
         3) Grinnell Products: www.grinnell.com/#sle.
         4) Viega LLC: www.viega.us/#sle.

2.06 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.
   2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
B. Flanges for Pipe Sizes Over 1 inch:
   1. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
C. No-Hub Couplings:
   1. Testing: In accordance with ASTM C1277 and CISPI 310.
   2. Gasket Material: Neoprene complying with ASTM C564.
   3. Band Material: Stainless steel.
   4. Eyelet Material: Stainless steel.
D. Shielded, Heavy Duty No-Hub Couplings:
   1. Testing: In accordance with ASTM C1540 and FM 1680.
   2. Gasket Material: Neoprene complying with ASTM C564.
   3. Band Material: Stainless steel.
   4. Eyelet Material: Stainless steel.
E. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.07 PIPE HANGERS AND SUPPORTS

A. See Section 22-0529 for additional requirements.
B. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.

4. Vertical Pipe Support: Steel riser clamp.

C. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
   3. Wall Support for Pipe Sizes to 3 inch: Cast iron hook.
   4. Wall Support for Pipe Sizes 4 inch and Over: Welded steel bracket and wrought steel clamp.

D. Plumbing Piping - Water:
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
   2. Hangers for Cold Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
   3. Hangers for Hot Pipe Sizes 2 to 4 inch: Carbon steel, adjustable, clevis.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs.
B. Remove scale and dirt, on inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
E. Group piping whenever practical at common elevations.
F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
G. Provide access where valves and fittings are not exposed.
H. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
J. Provide support for utility meters in accordance with requirements of utility companies.
K. Install bell and spigot pipe with bell end upstream.
L. Install valves with stems upright or horizontal, not inverted. See Section 22-0523.
M. Install water piping to ASME B31.9.
N. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
O. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
P. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Place hangers within 12 inches of each horizontal elbow.

3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

3.04 APPLICATION

A. Install unions at equipment or apparatus connections.
B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.05 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot (2%) slope.
B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 FIELD TESTS AND INSPECTIONS

A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.
B. Domestic Water Systems:
   1. Perform hydrostatic testing for leakage prior to system disinfection.
   2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
   3. General:
      a. Fill the system with water and raise static head to 10 psi above service pressure. Minimum static head of 50 to 150 psi. As an exception, certain codes allow a maximum static pressure of 80 psi.
   4. Metal Piping Systems Subject to Freezing Conditions:
      a. Inject 40 psi of compressed air into piping to spot check for leaks with liquid soap. Document and repair leaks as necessary.
      b. Raise injected compressed air pressure to 1.5 times rated service pressure or minimum pressure of 100 psi for a duration of 2 hours and verify with a gauge that no perceptible pressure drop is measured.
C. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.07 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 33-0110.58.
B. Prior to starting work, verify system is complete, flushed, and clean.
C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
D. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
F. Maintain disinfectant in system for 24 hours.
G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.08 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved double check backflow preventer and water meter with by-pass valves, pressure reducing valve.

END OF SECTION

SECTION 22-1006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.
B. Cleanouts.
C. Hose bibbs.
D. Hydrants.
E. Washing machine boxes and valves.
F. Refrigerator and ice maker valve and recessed box.
G. Backflow preventers.
H. Water hammer arrestors.
I. Sanitary waste interceptors.
J. Mixing valves.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 01-6000 - PRODUCT REQUIREMENTS for additional provisions.
    2. Extra Loose Keys for Outside Hose Bibbs: One.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Manufacturers:
    1. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
    2. Josam Company: www.josam.com/#sle.
    3. MIFAB, Inc: www.mifab.com/#sle.
    4. Zurn Industries, LLC: www.zurn.com/#sle.
    5. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
B. Floor Drains:
    1. Manufacturers:
        a. ACO, Inc: www.acobuildingdrainage.us/#sle.
        b. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
        c. MIFAB, Inc: www.mifab.com/#sle.
        d. Zurn Industries, LLC: www.zurn.com/#sle.
        e. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
C. Floor Drain:

1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, adjustable nickel-bronze strainer.
    a. Strainer: Provide square strainer when installed in tile floor and round strainer in all other applications unless otherwise noted on plans.

2.03 CLEANOUTS

A. Manufacturers:
    1. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
    2. Josam Company: www.josam.com/#sle.
    3. MIFAB, Inc: www.mifab.com/#sle.
    4. Zurn Industries, LLC: www.zurn.com/#sle.
    5. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
B. Cleanouts at Exterior Surfaced Areas:
    1. Round cast nickel bronze access frame and non-skid cover.
C. Cleanouts at Exterior Unsurfaced Areas:
    1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.
D. Cleanouts at Interior Finished Floor Areas:
    1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
E. Cleanouts at Interior Finished Wall Areas:
    1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.
F. Cleanouts at Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.04 HOSE BIBBS

A. Manufacturers:
    1. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
    2. Watts Regulator Company: www.wattsregulator.com/#sle.
    3. Zurn Industries, LLC: www.zurn.com/#sle.
    4. Woodford Manufacturing Company.
    5. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
B. Interior Hose Bibbs:
    1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome-plated where exposed with handwheel, integral vacuum breaker in compliance with ASSE 1011.

2.05 HYDRANTS

A. Manufacturers:
    1. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
    2. Zurn Industries, LLC: www.zurn.com/#sle.
    3. Watts Regulator Company.
    4. Woodford Manufacturing Company
    5. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
B. Wall Hydrants:

1. ASSE 1019; freeze resistant, self-draining type with chrome-plated lockable recessed box hose thread spout, handwheel, and integral vacuum breaker.

2.06 WASHING MACHINE BOXES AND VALVES

A. Box Manufacturers:
   1. IPS Corporation/Water-Tite: www.ipscorp.com/#sle.
   2. Oatey Supply Chain Services, Inc: www.oatey.com/#sle.
   3. Viega LLC: www.viega.us/#sle.
   4. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

B. Description: Metal preformed rough-in box with brass quarter turn valves with water hammer arre, socket for 2 inch waste, slip in finishing cover.

2.07 REFRIGERATOR AND ICE MAKER VALVE AND RECESSED BOX

A. Box Manufacturers:
   1. IPS Corporation/Water-Tite: www.ipscorp.com/#sle.
   2. Oatey Supply Chain Services, Inc: www.oatey.com/#sle.
   3. Viega LLC: www.viega.us/#sle.
   4. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

B. Description: Plastic preformed rough-in box with brass quarter turn valves, slip in finishing cover.

2.08 BACKFLOW PREVENTERS

A. Manufacturers:
   1. Apollo Valves: www.apollovalves.com/#sle.
   2. MIFAB, Inc: www.mifab.com/#sle.
   3. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com/#sle.
   4. Zurn Industries, LLC: www.zurn.com/#sle.
   5. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

B. Reduced Pressure Backflow Preventer Assembly:
   1. ASSE 1013; cast bronze body and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.
   2. Size: _____ inch assembly with threaded gate valves.

2.09 WATER HAMMER ARRESTORS

A. Manufacturers:
   1. Cash Acme, a brand of Reliance Worldwide Corporation: www.cashacme.com/#sle.
   2. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
   3. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com/#sle.
   4. Zurn Industries, LLC: www.zurn.com/#sle.
   5. Sioux Chief.
   6. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

B. Water Hammer Arrestors:

1. Copper construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

2.10 SANITARY WASTE INTERCEPTORS

A. Grease Interceptors:
   1. Construction:
      a. Material: Epoxy-coated fabricated steel.
      b. Rough-in: On floor.
      c. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port, recessed for floor finish.

2.11 MIXING VALVES

A. Master Thermostatic Mixing Valves:
   1. Manufacturers:
      a. Leonard Valve Company: www.leonardvalve.com/#sle.
      b. Lawler.
      c. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
   2. Valve: Cast brass body with corrosion resistant components, stainless teeel piston control mechanism, integral temperature adjustment.
   3. Capacity: See plans for required flow and allowable pressure drop.
   4. Accessories:
      a. Check valve on inlets.
      b. Strainer stop checks on inlets.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
C. Encase exterior cleanouts in concrete flush with grade.
D. Install floor cleanouts at elevation to accommodate finished floor.
E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
F. Pipe relief from backflow preventer to nearest drain.
G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to flush valve plumbing fixtures..

END OF SECTION

SECTION 22-1500 - GENERAL-SERVICE COMPRESSED-AIR SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and fittings.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.

B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept air compressors, refrigerated air dryer on site in factory-fabricated containers with shipping skids and plastic pipe end protectors in place. Inspect for damage.

B. Protect piping and equipment from weather and construction traffic.

1.05 WARRANTY

A. See Section 01-7800 - CLOSEOUT SUBMITTALS for additional warranty requirements.

B. Provide five year manufacturer warranty for reciprocating air compressors.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, solder, Grade Sn95.

C. Aluminum Tube: ASME B31.3, 6063 alloy, T5 temper.
   1. Manufacturers:
      a. Applied System Technologies: appliedsystemtech.com/#sle.
      b. Prevost Corporation: www.prevostusa.com/#sle.
   2. Maximum Working Pressure: 230 psi.
   3. Fittings and Joints 2-1/2 inch and Smaller:
      a. Fittings: Comply with ASME B31.1 and ASME B31.3, aluminum or iron.
      b. Joints: Mechanical compression, coupling, push-connect bite ring coupling with stainless steel clamping washer, or threading.
      c. Gasket Material: High nitrile rubber seal suitable for operating temperature range from minus 4 to 176 degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

B. Make air cock and drain connection on horizontal casing.

C. Install line size valve and check valve on compressor discharge. See Section 22-0523.

D. Connect condensate drains to nearest floor drain.

E. Install valved drip connections at low points of piping system. See Section 22-0523.
F. Install takeoffs to outlets from top of main, with shut off valve after takeoff. Slope takeoff piping to outlets.
G. Install compressed air couplings, female quick connectors, and pressure gauges where outlets are indicated.

3.02 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Compressed Air Piping Leak Test: Prior to initial operation, clean and test compressed air piping in accordance with ASME B31.1.
C. Repair or replace compressed air piping as required to eliminate leaks, and retest to demonstrate compliance.
D. Cap and seal ends of piping when not connected to mechanical equipment.

END OF SECTION

SECTION 22-3000 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial electric water heaters.
B. Diaphragm-type compression tanks.
C. Water softeners.
D. In-line circulator pumps.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittals procedures.
B. Product Data:
    1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
    2. Provide electrical characteristics and connection requirements.
C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.04 WARRANTY

A. See Section 01-7800 - CLOSEOUT SUBMITTALS for additional warranty requirements.
B. Provide three year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATERS

A. Commercial Electric Water Heaters:
    1. Manufacturers:
        a. Bradford White Corporation; ElectriFLEX Series: www.bradfordwhite.com/#sle.
        b. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
    2. Type: Factory-assembled and wired, electric, vertical storage.
    3. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
    4. Performance: See schedule
    5. Electrical Characteristics:
        a. 208 volts, three phase, 60 Hz.
    6. Tank: Glass lined welded steel; 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
    7. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.
    8. Accessories:
    9. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 W/sq in.

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Manufacturers:
   1. Amtrol Inc: www.amtrol.com/#sle.
   2. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.
   3. Taco, Inc: www.taco-hvac.com/#sle.
   4. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.
C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig.

2.03 WATER SOFTENERS

A. Salt-Based Ion-Exchange Water Softener:
   1. Manufacturers:
      a. Culligan International Company; _____: www.culligan.com/#sle.
      b. Fleck
      c. Sterling Water Treatment; _____: www.sterlingwatertreatment.com/#sle.
   2. Throughput: Hardness under 1 ppm or grain/gallon.
   3. Type: Separate ion exchange and feed tanks.
   4. Tank Materials: Epoxy lined steel ion exchange with one-piece resin for feed.
   5. Solenoid Valves: Brass or other process-resistant suitable material.
   6. Connections: 3/4 inch inlet, outlet, and backwash or regeneration with drain pipe.
   7. Multifunctional Controller:
      a. Allows metered, timed cycle, or continuous duty usage.
      b. Full control of both softening and backwashing processes.
      c. Includes setting to enable automated system water bypass.
      d. Stores maximum and minimum usage when in continuous duty.
      e. Displays setting, usage, and flow, date, time, and other related specifics.
      f. Provides status and historical usage data including ability to filter specifics.

2.04 IN-LINE CIRCULATOR PUMPS

A. Manufacturers:
   1. Armstrong Fluid Technology: www.armstrongfluidtechnology.com/#sle.
   2. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.
   3. Sterling SIHI GmbH: www.sterlingsihi.com/#sle.
   4. Taco.
   5. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.
C. Impeller: Bronze.
D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
E. Seal: Carbon rotating against a stationary ceramic seat.
F. Drive: Flexible coupling.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping and electrical work to achieve operating system.

C. Pumps:

1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3.02 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS for additional requirements.

END OF SECTION

SECTION 22-4000 - PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush valve water closets.
B. Wall hung urinals.
C. Lavatories.
D. Sinks.
E. Under-lavatory pipe supply covers.
F. Showers.
G. Bottle filling drinking fountains.
H. Electric water coolers.
I. Bi-level, electric water coolers.
J. Mop sinks.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.
B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 FLUSH VALVE WATER CLOSETS

A. Water Closets:
    1. Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
    2. Flush Valve: Exposed (top spud).
    3. Flush Operation: Sensor operated.
    4. Handle Height: 44 inches or less.
B. Flush Valves:
    1. Valve Supply Size: 1 inch.
    2. Valve Outlet Size: 1-1/2 inches.
    3. Manufacturers:
        a. American Standard, Inc: www.americanstandard-us.com/#sle.
        b. Sloan Valve Company: www.sloanvalve.com/#sle.
        c. Zurn Industries, LLC; ZEMS Series: www.zurn.com/#sle.
    4. Manual Operated:
        a. Type: ASME A112.18.1 or ASME A112.19.5; diaphragm type complete with vacuum breaker stops, and accessories.
        b. Supplied Volume Capacity: 1.5 gal per flush.

C. Toilet Seats:
   1. Manufacturers:
      a. American Standard, Inc: www.americanstandard-us.com/#sle.
      b. Bemis Manufacturing Company: www.bemismfg.com/#sle.
      c. Church Seat Company: www.churchseats.com/#sle.
      d. Olsonite: www.olsonite.com/#sle.
      e. Zurn Industries, LLC: www.zurn.com/#sle.
   2. Plastic: White finish, open front, extended back, self-sustaining hinge, brass bolts, with cover.

2.03 LAVATORIES

A. Wall-Hung Basin:
   1. Vitreous China: ASME A112.19.2; white rectangular basin with splash lip, front overflow, soap depression, and hanger. Size as indicated on drawings with 4 inch centerset spacing.
   2. Carrier:
      a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.
B. Drop-In Basin:
   1. Vitreous China: ASME A112.19.2; self-rimming, white, oval shape, front overflow, soap depression, seal of putty, calking, or concealed vinyl gasket, and white finish. Size as indicated on drawings with 4 inch centerset spacing.
C. Supply Faucet:
   1. ASME A112.18.1; chrome plated combination supply fitting with open grid strainer, water economy aerator with maximum flow of 2.2 gpm, indexed handles.
   2. Two Handle, Supply Faucet: ASME A112.18.1; deck-mount, ceramic cartridge disc valve, and maximum flow of 1.2 gpm.

2.04 SINKS

A. Manufacturers:
   1. American Standard, Inc; _____: www.americanstandard-us.com/#sle.
   2. Kohler Company; _____: www.kohler.com/#sle.
   3. Elkay.
B. Bowl
   1. ASME A112.19.3; 20 gauge, 0.0359 inch thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
   2. Drain: 1-1/2 inch chromed brass.
C. Accessories: Provide braided water supply lines, slip-joint p-trap, and stainless steel basket strainer.

2.05 UNDER-LAVATORY PIPE SUPPLY COVERS

A. Manufacturers:
   1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
   2. Truebro.
B. General:
   1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
   2. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.

a. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
b. Comply with ICC A117.1.

2.06 SHOWERS

A. Manufacturers:
1. American Standard, Inc: www.americanstandard-us.com/#sle.
2. Grohe America, Inc: www.grohe.com/us/#sle.
3. Kohler Company: www.kohler.com/#sle.

B. Shower Trim:
1. Single Handle: ASME A112.18.1; concealed straight way pattern valve with indexed cross handle.

C. Shower Valve:
1. Comply with ASME A112.18.1.
2. Provide two handle in-wall diverter valve body with integral thermostatic mixing valve to supply 1.5 gpm.

2.07 ELECTRIC WATER COOLERS

A. Manufacturers:
1. Elkay Manufacturing Company: www.elkay.com/#sle.
2. Haws Corporation: www.hawsco.com/#sle.
3. Oasis International: www.oasiscoolers.com/#sle.
4. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

B. Water Cooler: Electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
1. Capacity: 8 gph of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
2. Electrical: 115 VAC, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.

C. Bottle Filler: Materials to match fountain.

2.08 MOP SINKS

A. Terrazzo Mop Sink Manufacturers:

B. Material: Precast terrazzo composed of marble chips cast in Portland cement.

C. Type: Rectilinear, standard height.

D. Grid strainer: Stainless steel; integral; removable.

E. Accessories:
1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
2. Hose clamp hanger.
3. Mop hanger.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.
B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
C. Install components level and plumb.
D. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.
B. Do not permit use of fixtures by construction personnel.
C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23-0517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Pipe Sleeves: Schedule 40, galvanized steel pipe with plain ends.
B. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor in mechanical rooms and other wet areas otherwise flush with the floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
   4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
C. Pipe passing through interior walls, partitions, and floors. Interior gypsum partition penetrations concealed from view may omit sleeve if penetration is made neat and clean.
D. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, and Partitions: 1 inch greater than external pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 to prevent the spread of fire, smoke, and gases.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
B. Structural Considerations:
   1. Do not penetrate building structural members unless indicated.
C. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07-8400 to prevent the spread of fire, smoke, and gases.
   2. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

D. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 23-0529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03-3000.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Prefabricated Trapeze-Framed Metal Strut Systems:
   1. MFMA-4 compliant, pre-fabricated, MSS SP-58 type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.
   2. Strut Channel or Bracket Material:
   3. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

C. Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.

D. Pipe Supports:
   1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
   2. Liquid Temperatures Up To 122 degrees F:
      a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
      b. Support From Below: MSS SP-58 Types 35 through 38.

E. Pipe Hangers:
   1. Split Ring Hangers:
      a. Provide hinged split ring and yoke roller hanger with epoxy copper or plain finish.
      b. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
      c. Provide hanger rod and nuts of the same type and material for a given pipe run.
      d. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
   2. Band Hangers, Adjustable:
      a. MSS SP-58 Type 7 or 9, Zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
   3. Swivel Ring Hangers, Adjustable:
      a. MSS SP-58 Type 10, epoxy-painted, zinc-colored.
      b. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
      c. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.

F. Pipe Shields for Insulated Piping:
   1. MSS SP-58 Type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel
   2. General Construction and Requirements:
      a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
      b. Shields Material: UV-resistant polypropylene with glass fill.
      c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
      d. Minimum Service Temperature: Minus 40 degrees F.
      e. Maximum Service Temperature: 178 degrees F.
      f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
F. Equipment Support and Attachment:
    1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
    2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
    3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
    4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
G. Secure fasteners according to manufacturer's recommended torque settings.
H. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS for additional requirements.
B. Inspect support and attachment components for damage and defects.
C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 23-0593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.
B. Testing, adjustment, and balancing of hydronic systems.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
    1. Include at least the following in the plan:
        a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
        b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
        c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
        d. Final test report forms to be used.
        e. Procedures for formal deficiency reports, including scope, frequency and distribution.
C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
    1. Revise TAB plan to reflect actual procedures and submit as part of final report.
    2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
    3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
    4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
    5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
    1. AABC (NSTSB), AABC National Standards for Total System Balance.
    2. SMACNA (TAB).
B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
C. TAB Agency Qualifications:
    1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
    2. Having minimum of three years documented experience.
    3. Certified by one of the following:

a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Final filters are clean and in place. If required, install temporary media in addition to final filters.
4. Duct systems are clean of debris.
5. Fans are rotating correctly.
6. Fire and volume dampers are in place and open.
7. Access doors are closed and duct end caps are in place.
8. Air outlets are installed and connected.
9. Duct system leakage is minimized.
10. Hydronic systems are flushed, filled, and vented.
11. Pumps are rotating correctly.

3.03 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.
B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
C. Measure air quantities at air inlets and outlets.
D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

3.07 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

3.08 MINIMUM DATA TO BE REPORTED

A. Air Moving Equipment:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Air flow, specified and actual.
   5. Return air flow, specified and actual.
   6. Outside air flow, specified and actual.
   7. Total static pressure (total external), specified and actual.
B. Exhaust Fans:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Air flow, specified and actual.
   5. Total static pressure (total external), specified and actual.
C. Air Distribution Tests:
   1. Room number/location.
   2. Design air flow.
   3. Test (final) velocity.
   4. Percent of design air flow.

END OF SECTION

SECTION 23-0713 - DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.04 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Johns Manville: www.jm.com/#sle.
   3. Knauf Insulation; Atmosphere Duct Wrap: www.knaufinsulation.com/#sle.
   4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 1,200 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.
C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
E. Indoor Vapor Barrier Mastic:

2.03 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.
B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Insulated Ducts Conveying Air Below Ambient Temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
C. Insulated Ducts Conveying Air Above Ambient Temperature:
   1. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

3.03 SCHEDULES

A. Exhaust Ducts Within 10 ft of Exterior Openings:
B. Supply, Return and Outisde Air Ducts - Indoor
   1. 1-1/2 Inch thick 1.5 lbs/cubic foot

END OF SECTION

SECTION 23-0719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.04 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.
B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

A. Manufacturers:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Johns Manville Corporation: www.jm.com/#sle.
   3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com/#sle.
   4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com/#sle.
B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.
C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
D. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
   1. Aeroflex USA, Inc; Aerocel Stay-Seal with Protape (SSPT): www.aeroflexusa.com/#sle.
   2. Armacell LLC; ArmaFlex Ultra with FlameDefense: www.armacell.us/#sle.
   3. K-Flex USA LLC; K-Flex Titan: www.kflexusa.com/#sle.
B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 180 degrees F.

3. Connection: Waterproof vapor barrier adhesive.

2.04 ACCESSORIES

A. General Requirements:
   1. Furnish compatible materials which do not contribute to corrosion, soften, or otherwise attack surfaces to which applied, in either the wet or dry state.
   2. Comply with ASTM C795 requirements for materials to be used on stainless steel surfaces.
   3. Supply materials that are asbestos free.
B. Corrosion Inhibitors:
   1. Corrosion Control Gel:
      a. Corrosion Protection: Comply with ASTM B117 and ASTM D610.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.
B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Exposed Piping: Locate insulation and cover seams in least visible locations.
C. Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

3.03 SCHEDULE

A. Heating Systems:
   1. Heating Water Supply and Return:
B. Cooling Systems:
   1. Cold Condensate Drains:
      a. 1/2 inch thick
   2. Refrigerant Suction and Hot Gas
      a. Minimum required to meet energy code.

END OF SECTION

SECTION 23-1123 - FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for natural gas piping systems.

1.02 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
B. Provide temporary protective coating on cast iron and steel valves.

PART 2 PRODUCTS

2.01 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.
   1. Fittings: ASTM A234/A234M, wrought steel welding type.
   2. Joints: ANSI Z223.1, welded.
   3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

2.02 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

2.03 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.

2.04 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.

2.05 BALL VALVES

A. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze body, 304 stainless steel or chrome plated brass ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder or threaded ends with union.

2.06 LINE PRESSURE REGULATORS AND APPLIANCE REGULATORS INDICATORS

A. Compliance Requirements:
   1. Line Pressure Regulator: ANSI Z21.80/CSA 6.22.
B. Maximum Inlet Operating Pressure: 10 psi.
   1. Line Pressure Regulator: 10 psi.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
B. Remove scale and dirt, on inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
C. Install piping to maintain headroom, conserve space, and not interfere with use of space.
D. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
E. Provide access where valves and fittings are not exposed.
F. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
G. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
H. Sleeve pipes passing through partitions, walls and floors.
I. Pipe Hangers and Supports:
    1. Install in accordance with ASME B31.9.
    2. Support horizontal piping as indicated.
    3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
    4. Place hangers within 12 inches of each horizontal elbow.
    5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.

3.04 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.
B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.05 SCHEDULES

A. Pipe Hanger Spacing:
    1. Metal Piping:
        a. Pipe Size: 1/2 inches to 1-1/4 inches:
            1) Maximum Hanger Spacing: 6.5 ft.
            2) Hanger Rod Diameter: 3/8 inches.
        b. Pipe Size: 1-1/2 inches to 2 inches:
            1) Maximum Hanger Spacing: 10 ft.
            2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION

SECTION 23-2113 - HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hydronic system requirements.
B. Heating water piping, above grade.
C. Radiant heating piping system.
D. Equipment drains and overflows.
E. Pipe hangers and supports.
F. Unions, flanges, mechanical couplings, and dielectric connections.
G. Valves:

1.02 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data:
    1. Include data on pipe materials, pipe fittings, valves, and accessories.
C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.06 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
    1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
    2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
    3. Grooved mechanical joints may be used in accessible locations only.
        a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.

b. Use rigid joints unless otherwise indicated.

4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated:

2.02 HEATING WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:

1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
2. Threaded Joints: ASME B16.3, malleable iron fittings.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.

2.03 RADIANT HEATING PIPING

A. Cross-Linked Polyethylene (PEX) Pipe: ASTM F876 or ASTM F877.

1. Fittings: Brass and copper.
2. Joints: Mechanical compression fittings.

2.04 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

B. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.

1. Fittings: ASTM D2466 or D2467, PVC.
2. Joints: Solvent welded in accordance with ASTM D2855.

2.05 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2.06 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe of 2 Inches and Less:

B. Flanges for Pipe 2 Inches and Greater:

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.

1. Dimensions and Testing: In accordance with AWWA C606.
2. Mechanical Couplings: Comply with ASTM F1476.
3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.
C. Remove scale and dirt on inside and outside before assembly.
D. Prepare piping connections to equipment using jointing system specified.
E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
F. After completion, fill, clean, and treat systems. See Section 23-2500 for additional requirements.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
D. Install piping to conserve building space and to avoid interference with use of space.
E. Group piping whenever practical at common elevations.
F. Slope piping and arrange to drain at low points.

3.03 SCHEDULES

A. Hanger Spacing for Steel Piping.
   1. 1/2 Inch, 3/4 Inch, and 1 Inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
   2. 1-1/4 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   3. 1-1/2 Inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.

END OF SECTION

SECTION 23-2300 - REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.
B. Refrigerant.
C. Moisture and liquid indicators.
D. Valves.
E. Strainers.
F. Filter-driers.

1.02 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.
B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
C. Filter-Driers:
    1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
    2. Use a filter-drier on suction line just ahead of compressor.
    3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.
    4. Use sealed filter-driers in low temperature systems.
    5. Use sealed filter-driers in systems utilizing hermetic compressors.
    6. Use replaceable core filter-driers in lines of 1/2 inch outside diameter or greater.
    7. Use replaceable core liquid-line filter-driers in systems utilizing receivers.

2.02 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 for installation of piping system.
B. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

2.03 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
    1. Fittings: ASME B16.22 wrought copper.
    2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
B. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
    1. Fittings: ASME B16.26 cast copper.
    2. Joints: Flared.
C. Pipe Supports and Anchors:

1. Provide hangers and supports that comply with MSS SP-58.
    a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Vertical Support: Steel riser clamp.
7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
8. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
9. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.04 FILTER-DRIERS

A. Performance:
    1. Flow Capacity - Liquid Line: As indicated in schedule, minimum, rated in accordance with AHRI 710 (I-P) (AHRI 711 (SI)).
    2. Flow Capacity - Suction Line: As indicated in schedule, minimum, rated in accordance with AHRI 730 (I-P).
    3. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
    4. Design Working Pressure: 350 psi, minimum.
B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
C. Construction: UL listed.
    1. Replaceable Core Type: Steel shell with removable cap.
    2. Sealed Type: Copper shell.
    3. Connections: As specified for applicable pipe type.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs.
B. Remove scale and dirt on inside and outside before assembly.
C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.
B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
C. Install piping to conserve building space and avoid interference with use of space.
D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
E. Flood piping system with nitrogen when brazing.
F. Insulate piping and equipment.
G. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Test refrigeration system in accordance with ASME B31.5.
C. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test to no leakage.

END OF SECTION

SECTION 23-2500 - HVAC WATER TREATMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials.
   1. Closed system treatment (water).

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.
C. Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.
D. Operation and Maintenance Data: Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.
E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.

1.03 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

2.02 MATERIALS

A. Closed System Treatment (Water):
   1. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.

PART 3 EXECUTION

3.01 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.
B. Place terminal control valves in open position during cleaning.
C. Verify that electric power is available and of the correct characteristics.

3.02 CLEANING SEQUENCE

A. Hot Water Heating Systems:
   1. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum.
   2. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.
   3. Circulate for 6 hours at design temperatures, then drain.
   4. Refill with clean water and repeat until system cleaner is removed.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.04 CLOSED SYSTEM TREATMENT

A. Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around balancing valve downstream of circulating pumps unless indicated otherwise.
B. Introduce closed system treatment through bypass feeder when required or indicated by test.
C. Provide 3/4 inch water coupon rack around circulating pumps with space for 4 test specimens.

3.05 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation and maintenance of chemical treatment system.
   1. Provide minimum of two hours of instruction for two people.
   2. Have operation and maintenance data prepared and available for review during training.
   3. Conduct training using actual equipment after treated system has been put into full operation.

3.06 MAINTENANCE

A. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the equipment manufacturer or original installer.
B. Provide service and maintenance of treatment systems for one year from Date of Substantial Completion.
C. Provide monthly technical service visits to perform field inspections and make water analysis on-site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.
D. Provide laboratory and technical assistance services during this maintenance period.
E. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based upon these inspections.

END OF SECTION

SECTION 23-3100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ducts.
B. Ducts for kitchen exhaust applications.

1.02 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.
C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 23-3319.
D. Seismic Restraint: Fabricate in compliance with ICC (IMC) requirements; see Section 23-0548.
E. Duct Shape and Material in accordance with Allowed Static Pressure Range:
F. Duct Fabrication Requirements:
    1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
    2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
    3. Construct tee's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
    4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
    5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
    6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
    7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.02 METAL DUCTS

A. Material Requirements:
    1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
B. Round Metal Ducts:
    1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
    2. Round Connection System: Interlocking duct connection system per SMACNA (DCS).

C. Round Spiral Duct:
   1. Round spiral lock seam duct with galvanized steel outer wall.
D. Connectors, Fittings, Sealants, and Miscellaneous:
   1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
   2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
   3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
      a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
      b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
   4. Gasket Tape:
      a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.
   5. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
E. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form a spiral helix.
   1. Insulation: R6 insulation with polyethylene vapor barrier film.
   2. Pressure Rating: 10 in-wc positive and 5 in-wc negative.
   3. Maximum Velocity: 5500 fpm.
   4. Temperature Range: Minus 20 degrees F to 250 degrees F.

2.03 DUCTS FOR KITCHEN EXHAUST APPLICATIONS

A. Provide ductwork, fittings, and appurtenances per NFPA 96, SMACNA (KVS), UL 1978, and UL 2221 requirements and guidelines.
B. Class 1 duct for air with gas and grease particle exhaust at an air velocity of 1,500 to 2,500 fpm.
C. Where ducts are not self-draining back to equipment, provide low point drain pocket with the copper drain pipe to a sanitary sewer.
D. Designed, fabricated, and installed to be liquid tight preventing exhaust leakage into the building.
E. Kitchen Hood and Grease Exhaust Duct:
   1. Fabricate in accordance with ductwork manufacturer's instructions, SMACNA (DCS), SMACNA (KVS), and NFPA 96.
   2. Double-Wall, Premanufactured, Noncombustible Kitchen Exhaust Ducts:
      a. Comply with ASTM E2336.
      b. Construct of 18 gauge, 0.050 inch stainless steel using continuous external welded joints in rectangular sections.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).
B. Install products following the manufacturer's instructions.
C. Comply with safety standards NFPA 90A and NFPA 90B.

D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.
E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
F. Flexible Ducts: Connect to metal ducts with adhesive plus sheet metal screws.
G. Kitchen Hood Exhaust: Provide residue traps at the base of vertical risers with provisions for the cleanout.
H. Duct sizes indicated are inside precise dimensions. For lined ducts, maintain sizes inside lining.
I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
J. Connect diffusers or light troffer boots to low-pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.
K. Louver Fit-out:
    1. Provide blank-out panels sealing available area of wall-mounted exterior-faced louver when connected ductwork is smaller than actual louver free area, and duct outlet is smaller than the louver frame.
    2. Use the same duct material painted black on the exterior side, then seal louver frame and duct.
L. Fire Partitions: Provide firestopping sealing as indicated within Section 07-8400.
M. Duct Insulation: Provide duct insulation in compliance with Section 23-0713.
N. Painting: Provide surface finish as indicated on drawings and Sections 09-9113 and 09-9123.

END OF SECTION

SECTION 23-3300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Combination fire and smoke dampers.
B. Duct access doors.
C. Fire dampers.
D. Flexible duct connectors.
E. Smoke dampers.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01-6000 - PRODUCT REQUIREMENTS for additional provisions.
   2. Extra Fusible Links: One of each type and size.

PART 2 PRODUCTS

2.01 COMBINATION FIRE AND SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.
B. Provide factory sleeve and collar for each damper.
C. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.
D. Operators: UL listed and labeled spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on interior of duct and link to damper operating shaft.

2.02 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.
B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.

2.03 FIRE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
B. Horizontal Dampers: Galvanized steel, 22 gauge, 0.0299 inch frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
C. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.
D. Multiple Blade Dampers: 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
E. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.04 FLEXIBLE DUCT CONNECTORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.
B. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd.
      a. Net Fabric Width: Approximately 2 inches wide.
   2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.

2.05 SMOKE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.
B. Dampers: UL Class 1 airfoil blade type smoke damper, normally open automatically operated by pneumatic actuator.
C. Electro Thermal Link: Fusible link melting at 165 degrees F; 120 volts, single phase, 60 Hz; UL listed and labeled.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23-3100 for duct construction and pressure class.
B. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch for balancing dampers only. Review locations prior to fabrication.
C. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
D. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
E. Demonstrate re-setting of fire dampers to Owner's representative.
F. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

END OF SECTION

SECTION 23-3423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof exhausters.
B. Wall exhausters.
C. Ceiling exhaust fans.
D. Inline centrifugal fans and blowers.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate fan roof curbs and service utilities installation according to fan size.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.
C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.
    2. Extra Fan Belts: One set for each individual fan.

PART 2 PRODUCTS

2.01 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: Comply with AMCA 204.
B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.
C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.
D. Fabrication: Comply with AMCA 99.
E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.02 ROOF EXHAUSTERS

A. Manufacturers:
    1. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.
    2. Twin City Fan & Blower; BCRD: www.tcf.com/#sle.
    3. Loren Cook.
    4. Soler & Palau.
B. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
C. Roof Curb: 8 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips.
D. Disconnect Switch: Factory wired, nonfusible, in housing for thermal overload protected motor and wall mounted multiple speed switch.

E. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

F. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm gets attained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.03 WALL EXHAUSTERS

A. Manufacturers:
   1. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.
   2. Loren Cook.
   3. Hunter.

B. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.

C. Disconnect Switch: Factory wired, nonfusible, in housing for thermal overload protected motor, and wall mounted multiple speed switch.

D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

E. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm can be reached with sheaves set at mid-position; fan shaft with self-aligning prelubricated ball bearings.

2.04 CEILING EXHAUST FANS

A. Manufacturers:
   1. Broan-NuTone, LLC; 744 Recessed Ventilation Fan with Light: www.broan-nutone.com/#sle.
   2. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.
   3. PennBarry, Division of Air System Components; _____: www.pennbarry.com/#sle.
   4. Twin City Fan & Blower; T: www.tcf.com/#sle.

B. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resiliently mounted motor, gravity backdraft damper in discharge.

C. Grille: Aluminum with baked white enamel finish.

D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is reached with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.05 INLINE CENTRIFUGAL FANS AND BLOWERS

A. Centrifugal Fan Unit: V-belt or direct driven, with galvanized steel housing lined with acoustic insulation, resiliently-mounted motor, gravity backdraft damper in discharge.

B. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm gets reached with sheaves set at mid-position; fan shaft with self-aligning prelubricated ball bearings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
D. Hung Cabinet Fans:
    1. Install fans with resilient mountings and flexible electrical leads, see Section 23-0548.
E. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION

SECTION 23-3439 - HIGH-VOLUME, LOW-SPEED PROPELLER FANS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High-volume, low-speed propeller fans.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.

B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.

C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 507.

B. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.02 HIGH-VOLUME, LOW-SPEED PROPELLER FANS

A. Manufacturers:
   1. Big Ass Fan.
   2. Greenheck.
   3. Macro Air.
   4. Hunter.
   5. Sky Blade.
   6. Vivid Air.

B. Shafts and Bearings:
   1. Fan Shaft:
      a. Ground and polished steel with anti-corrosive coating.
      b. First critical speed at least 25 percent over maximum cataloged operating speed.
   2. Bearings:
      a. Permanently sealed or pillow block type.
      b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
      c. 100 percent factory tested.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure fan with stainless steel lag screws to structure.

C. Ceiling-mounted Fans:
   1. Install fans with resilient mountings and flexible electrical leads. See Section 23-0548.

D. Provide sheaves required for final air balance for belt-driven motors.

END OF SECTION

SECTION 23-3700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Registers, Grilles, and Diffusers
B. Louvers:
C. Roof hoods.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Krueger-HVAC.
B. Nailor.
C. Price Industries.
D. Titus, a brand of Air Distribution Technologies.
E. Metalaire, a brand of Metal Industries Inc.
F. United Enertech.
G. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

2.02 REGISTERS, GRILLES AND DIFFUSERS

A. See plans for exact details and information.

2.03 LOUVERS

A. Manufacturers:
    1. Ruskin Company:.
    2. Greenheck.
    3. Nailor.
    4. United Enertech.
    5. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
B. Type: 6 inch deep frame with drainable brades, heavy channel frame, 1/2 inch square mesh screen over intake or exhaust end.
C. Color: As indicated on the drawings.

2.04 FEMA LOUVERS

1. Manufacturers:
    a. Ruskin Company.
    b. Greenheck.
    c. Nailor.
    d. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

B. Type: 6 inch deep frame with chevron style blades, heavy gauge extruded alumnium, heavy channel frame.

C. Fabrication: Heavy gauge alumnium frame and blades with channel frame. Louver to be rated to FEMA Guidelines P-320, P-361 and ICC-500 for static and cyclical pressures of -250/+250 psi and debris impact of 15lb 2x4 traveling at 100 miles per hour.
   1. Color: As indicated on the drawings.

2.05 ROOF HOODS

A. Manufacturers:
B. Fabricate of galvanized steel, minimum 16 gauge, 0.0598 inch base and 20 gauge, 0.0359 inch hood, or aluminum, minimum 16 gauge, 0.0598 inch base and 18 gauge, 0.0598 inch hood; suitably reinforced; with removable hood; birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake, and factory prime coat finish.
C. Mount unit on minimum 12 inch high curb base with insulation between duct and curb.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
C. Install diffusers to ductwork with air tight connection.
D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
E. Paint ductwork visible behind air outlets and inlets matte black, see Section 09-9123.

END OF SECTION

SECTION 23-3813 - COMMERCIAL-KITCHEN HOODS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cooking hoods.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions, adjusting and balancing methods.

C. Test Reports for Grease Extracting Hoods: Provide test reports substantiating exhaust volume ratings and grease extraction performance.

D. Operation and Maintenance Data.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Grease Extracting Hoods:
   1. Captiveaire.
   2. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.
   3. _____.

2.02 HOOD APPLICATIONS

A. Canopy-Style Cooking Hoods:
   1. Style: Wall-attached canopy.
   2. Type: Grease extracting type, no water wash.

2.03 HOOD CONSTRUCTION

A. Provide products that comply with NFPA 96, the requirements and recommendations of SMACNA (KVS), and the requirements of the Authorities Having Jurisdiction.

B. Cooking Hoods: Provide Type I hoods, with all external joints and seams continuously welded, liquid-tight, and all internal joints, seams, and attachments sealed liquid-tight and grease-tight.
   1. Provide fire extinguishing system for all cooking hoods.
   2. Provide complete assemblies listed and labeled by UL under UL 710 for its intended use.

C. Construction: Materials, inside and out, are stainless steel complying with ASTM A666, Type 304, stretcher leveled; unless otherwise indicated.
   1. Sheet Thickness: 18 gauge, 0.048 inch, minimum.
   2. Fabrication: Fabricate each individual hood in one piece, with all welds ground and finished to match (inside and out); fabricate flat surfaces exposed to view as double-pan formed panels with internal stiffener members.
   3. Finish on Surfaces Exposed to View: No.4 (brushed directional); provide stainless steel faces on all sides exposed to view.
   4. Finish on Concealed Surfaces: No.4 or No.2B (dull, matte).

5. Duct Collars: For exhaust and make-up air openings, provide duct collar welded to hood unit; minimum of 8 inches extension from top or back face of unit, with minimum one inch 90 degree flange, unless otherwise indicated.
6. Access Panels: Provide removable or hinged access panels sufficient for maintenance and replacement of operating components inside unit; maximum width of 40 inches.
7. Supports: Stainless steel mounting brackets, struts, and threaded hanger rods.
    a. Hanger Rods: 3/8 inch diameter, minimum.
    b. Hanger Spacing: 48 inches on center, maximum.
    c. Attachment to Structure: Mechanical fittings or inserts, stainless steel.

2.04 GREASE EXTRACTING HOODS

A. Grease Extracting Hoods: Pre-engineered, factory-fabricated standard products; high-velocity centrifugal grease extraction without requiring filters, cartridges, moving parts, removable parts, with grease collected in gutter piped to drain, and as specified above.
    1. Performance: Remove 95 percent of extraneous matter in air stream at rated air velocity; provide substantiation.
    2. Grease Extracting Baffles: Non-removable, adjustable for balancing.
    3. Access Panels: Provide removable panels, with handles, for access to exhaust plenum for cleaning.
    4. Label: Provide permanent label indicating rated exhaust performance.

2.05 HOOD ACCESSORIES

A. Fire Extinguishing Systems:
    1. Fire extinguishing system to comply with NFPA 96.
    2. Exposed Piping Under Hood: Stainless steel or chrome plated.
    3. Exposed Piping Outside Hood: Not permitted.
    4. Nozzles: Stainless steel or chrome plated brass.
    5. Electrical Components: Provide all components required for properly operating system, including but not limited to wiring, raceways, contactors, circuit breakers, switches and solenoids.
    6. Manual Actuators: Wall-mounted pull stations; provide one near each hood and one near exit door.

B. Controls:
    1. Fans: Provide manual push button controls for starting and stopping fans and labeled indicator lights showing fan status.
    2. Fans: Provide controls for fan operation by time clock, programmable by the week, capable of maintaining time cycle after operation of manual push buttons.
    3. Cooking Equipment: Provide manual shutoff and reset button located where indicated; combine with fire extinguishing actuation.
    4. Fire Extinguishing System: Provide automatic actuation complying with NFPA 96; provide local and remote manual actuating stations clearly labeled "Hood Fire Protection"; upon actuation of fire extinguishing system, automatically:
        a. Shut off fans serving that hood.
        b. Shut off fuel source to equipment under hood; actuate solenoid gas valves provided as part of gas piping work.
        c. Shut off electric power to equipment under hood; actuate contactors or switches provided as part of electrical work.

d. Signal building fire alarm system; normally-open contacts.

C. Control Panels: Factory assembled and pre-wired, ready for utility connections.
1. UL listed for use with specific hood.
2. Provide a single control panel combining all control functions for a particular hood, unless otherwise indicated.
3. Provide a single control panel for each group of hoods served by a single exhaust fan.
4. Enclosures: Flush-mounted; stainless steel, to match hood.
5. Provide indicator lights on control panel door showing status of fans and power supply.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that overhead supports are installed in correct locations.
B. Do not begin installation until substrates have been properly prepared.
C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and NFPA 96.
B. Install hoods level and plumb, securely fastened, with seismic restraints as specified, and free of vibration during normal operation.
C. Weld hood duct collars to ductwork, liquid-tight.
D. Connect to utilities.

3.04 SYSTEM STARTUP

A. Obtain the services of the manufacturer's representative experienced in the installation, adjustment, and operation of the equipment to supervise the starting and adjusting of equipment.
B. Prepare equipment for startup, start and operate equipment for sufficient period to verify proper operation; correct equipment not operating correctly.
C. Demonstrate operation to Owner's designated personnel.
D. Report deficiencies in writing to Architect.

3.05 CLOSEOUT ACTIVITIES

A. Conduct training of Owner's designated personnel in the operation and maintenance of equipment.
B. Perform at least 2 hours of training, for minimum of 2 people, at project site.
C. Arrange training sessions with Owner at least 2 weeks in advance.
D. Have operation and maintenance data on hand for training sessions.

3.06 CLEANING

A. Clean surfaces of equipment.

3.07 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23-5533 - FUEL-FIRED UNIT HEATERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Gas fired unit heaters.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listing.
D. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 01-6000 - PRODUCT REQUIREMENTS - Project Requirements, for additional provisions.

1.03 WARRANTY

A. See Section 01-7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.
B. Provide five year manufacturers warranty for heat exchangers.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

2.02 GAS FIRED UNIT HEATERS

A. Manufacturers:
    1. Modine Manufacturing Company: www.modine.com/#sle.
    2. Sterling HVAC/Mestek Technology, Inc: www.sterlinghvac.com/#sle.
    3. Reznor/Thomas & Betts Corporation: www.reznorhvac.com/#sle.
B. Unit Heaters: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, burner, controls, and accessories:
    1. Heating: Natural gas fired.
    2. Discharge Louvers: Individually adjustable horizontal and vertical louvers to match cabinet finish.
C. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation and reflective liner.
D. Supply Fan: Propeller type with direct drive, variable pitch motor pulley.
E. Heat Exchanger: Aluminized steel welded construction.
F. Gas Burner:
    1. Sealed combusiton type with adjustable combustion air supply.
    2. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
    3. Electronic pilot ignition, with electric spark igniter.
G. Gas Burner Safety Controls:

1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
2. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.

H. Operating Controls:
1. Room Thermostat: Cycles burner to maintain room temperature setting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that space is ready for installation of units and openings are as indicated on shop drawings.
B. Verify that proper power supply is available.
C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

A. Install in accordance with NFPA 90A.
B. Install gas fired units in accordance with NFPA 54 and applicable codes.
C. Provide vent connections in accordance with NFPA 211. Re-fert
D. Provide connection to electrical power systems; refer to Section 26-0583.

END OF SECTION

SECTION 23-7433 - DEDICATED OUTDOOR AIR UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Indoor-mounted DOAS.

1.02 SUBMITTALS

A. Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

B. Operation And Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Filters: One set of each type and size.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Applied Air, a company of Mestek, Inc: www.appliedair.com/#sle.

B. Greenheck: www.greenheck.com/#sle.

C. York a brand of Johnson Controls International, Plc: www.york.com/#sle.

D. AAON.

E. [Addison.].

F. [Engineered Air.].

G. [LCSystems.].

H. Trane

I. Daikin

J. Valent Air, a company of Greenheck Group

K. Carrier

L. NextGen

2.02 INDOOR-MOUNTED DOAS

A. Packaged Unit:

1. Casing and Components:
    a. Fabrication: AHRI 210/240 and UL 207 construction, ASHRAE Std 23.1 tested.
    b. 18 gauge, 0.0478 inch steel panels reinforced with structural angles and channels to ensure rigidity.
    c. Provide bolted access panels to access each sections from either side of unit.
    d. Provide hinged door with lockable handle for serviceable sections.
    e. Drain Pan: Stainless steel.
2. Performance Ratings: ASHRAE Std 90.1, EER and COP as applicable.
3. Regulatory Requirements: AHRI 270 rated, NFPA 70, and UL (DIR) listed.
4. Insulation: Foam injected panels with a minimum R-13 insulating value.
5. External Surface Finish: Heat resistant baked enamel.

B. Filter Section:

1. Filter: Removable, 2 and 4 inches thick MERV 8 and MERV 13.

C. Heating Section:

1. Electrical:

a. Finned tube heating elements easily accessible with automatic reset thermal cut-out, built-in silicone-controlled rectifier (SCR) interface, galvanized steel frame with airflow proving switch, load fuse, manual reset switch, pilot-duty toggle switches, step-down controls transformer, service lights, service GFCI receptacle, and thermal cut-out switch.
b. Controls: Start supply fan before electric elements are energized and continue operating until air temperature reaches minimum setting, with switch for continuous fan operation. Integrate or coordinate controls with unit controller.

D. Cooling Section:
1. Packaged DX Cooling:
a. Configuration: AHRI 520 rated, R-410a refrigerant system with hot gas bypass.
b. Evaporator Coil: Copper tube aluminum fin coil assembly with alternate row circuiting, and with galvanized drain pan and thermostatic expansion valve.
c. Operating and Safety Controls: Internally coordinated with main unit controls.

E. Fan Section:
1. Provide direct or plenum mounted variable-speed fan motors.
2. Draw-through, forward-curved fan, constructed of corrosion-resistant, galvanized material and designed for efficient, quiet operation.
3. Factory program for both soft start and constant flow output over static pressure range.
4. Provide preinstalled neutral wire protection when required to support specified fan type.
5. Motor to include thermal overload protection, quick disconnect plug, and permanently lubricated bearings.
6. Variable Speed Control: Configure controller to maintain adjustable flow setpoint for modulating or speed-switched units; see Section 23-0934.
7. Fan Turndown: Design control features to allow fan speed reduction to adjustable 50 percent of its capacity when the zone set point temperature is satisfied or when unit runs in fan-only mode.

F. Unit Controls:
1. DDC:
a. Application Specific Controller.
b. Tested to monitor and handle sequencing functions and other operational modes using field-mounted thermostat and other sensors.
c. Coordination and Sequencing:
1) Internal Devices: Include compressors, blower, sensors, switches, valves, safeties, other components.
2) Field-Installed Devices: Solenoid valves, thermostat, EWT sensors, LWT sensors, internal and remote contacts, and other devices required for operation.
3) Safeties: At minimum include anti-short-cycle compressor protection, condensate overflow, refrigerant high pressure, refrigerant low pressure, loss-of-charge, refrigerant freeze protection, and freezestat.

G. Electrical: 208 VAC, 3-phase, 60 Hz, single point to factory-mounted nonfused disconnect switch internally wired into motors and compressors, and other powered components including system safeties.

H. Furnish dedicated outdoor air unit and associated components and accessories produced by a single manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide unit- or duct-mounted smoke detectors and other NFPA 90A provisions.
C. Connect drain pan outlet to nearest building drain system piping.
D. Adjusting: Use plenum static pressure readings against manufacturer calibration chart to adjust primary airflow as other measuring methods will not work.
E. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s).

3.02 MAINTENANCE

A. See Section 01-7000 - EXECUTION AND CLOSEOUT REQUIREMENTS for additional requirements.
B. Provide service and maintenance of units for one year from Date of Substantial Completion.

END OF SECTION

SECTION 23-8129 - VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air-source outdoor units.
B. Refrigerant piping.
C. Refrigerant branch units.
D. Indoor units.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings indicated in Contract Documents:
    1. Outdoor Units:
        a. Refrigerant Type and Size of Charge.
        b. Output and Input Cooling Capacity: Btu/h.
        c. Output and Input Heating Capacity: Btu/h.
        d. Operating Temperature Range, Cooling and Heating.
        e. Fan Capacity: Flow in cfm with respective fan curves.
        f. External Static Pressure (ESP): In-wc.
        g. Sound Pressure Level: dB(A).
        h. Electrical Data: Complete including motor size.
        i. Maximum number of indoor units that can be served.
        j. Maximum refrigerant piping run from outdoor unit to indoor unit(s).
        k. Maximum height difference between outdoor unit to Indoor unit(s), both above and below.
    2. Indoor Units:
        a. Output and Input Cooling Capacity: Btu/h.
        b. Output and Input Heating Capacity: Btu/h.
        c. Fan Capacity: Flow in cfm with respective fan curves.
        d. External Static Pressure (ESP): In-wc.
        e. Electrical Data: Complete including motor size.
        f. Maximum Lift of Built-in Condensate Pump.
    3. Control Panels: Complete data of controllers, input-output points, and zones.
C. Shop Drawings: Installation drawings custom-made for this project; include as-designed HVAC layouts, locations of equipment items, refrigerant piping sizes and locations, condensate piping sizes and locations, remote sensing devices, control components, electrical connections, control wiring connections. Include:
    1. Detailed piping diagrams, with branch balancing devices.
    2. Condensate piping routing, size, and pump connections.
    3. Detailed power wiring diagrams.
    4. Detailed control wiring diagrams.
    5. Locations of required access through fixed construction.
    6. Drawings required by manufacturer.
D. Operating and Maintenance Data:

1. Manufacturer's complete standard instructions for each unit of equipment and control panel.
2. Custom-prepared system operation, troubleshooting, and maintenance instructions and recommendations.
3. Identification of replaceable parts and local source of supply.

E. Warranty: Executed warranty, made out in Owner's name.

1.03 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle equipment and refrigerant piping according to manufacturer's recommendations.

1.04 WARRANTY

A. See Section 01-7800 - CLOSEOUT SUBMITTALS for additional warranty requirements.

B. Compressors: Provide manufacturer's warranty for 6 years from date of installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Daikin: www.daikinac.com/#sle.

B. LG Electronics U.S.A., Inc: www.lghvac.com/#sle.

C. Mitsubishi Electric Trane HVAC US, LLC: www.metahvac.com/#sle.

D. Samsung HVAC America.

2.02 VARIABLE REFRIGERANT FLOW SYSTEM

A. Minimum System Requirements:
1. System Testing, Capacity Rating, and Performance:
   a. AHRI 1230 when cooling capacity is equal or greater than 65,000 Btu/h.
   b. AHRI 210/240 when cooling capacity is below 65,000 Btu/h.
2. Safety Certification: Bear UL 1995 tested and ITS (DIR) listed certification label.
3. Outdoor Units: Furnish installation and surface support hardware products in accordance with ASCE 7 for wind restraint.
4. Cooling Mode Interior Performance:
   a. Daytime Setpoint: 68 degrees F, plus or minus 2 degrees F.
   b. Setpoint Range: 57 degrees F to 77 degrees F.
   c. Night Setback: 78 degrees F.
   d. Interior Relative Humidity: 20 percent, maximum.

2.03 AIR-SOURCE OUTDOOR UNITS

A. Air Conditioning Type:
1. DX refrigeration unit piped to one or more compatible indoor units either directly or indirectly through one or more intermediate refrigeration branch units.

B. Unit Cabinet:
1. Capable of being installed with wiring and piping to the left, right, rear or bottom.
2. Designed to allow side-by-side installation with minimum spacing and vibration isolation.
3. Weatherproof and corrosion resistant; rust-proofed mild steel panels coated with baked enamel finish.
4. Sound Pressure Level: 55 dB measured at 3 feet from front of unit.

C. Heat Sink Side:

1. Condenser Fans:
    a. Provide minimum of 2 fans for each condenser within the outdoor unit.
    b. Minimum External Static Pressure: Factory set at 0.12 in-wc.
    c. Fan Type: Vertical discharging, direct-driven propeller type with variable speed operation using DC-controlled ECM motors mechanically connected using permanently lubricated bearings having whole assembly protected with fan guards.
2. Condenser Coils:
    a. Hi-X seamless copper tubes expanded into aluminum fins to form mechanical bond; waffle louver fin and rifled bore tube design to ensure high efficiency performance.

D. Refrigeration Side:
1. Factory assembled and wired with instrumentation, switches, and controller(s) to handle unit specifics with direct coordination of remote controller(s) from indoor unit(s).
2. Refrigeration Circuit: ECM driven dual scroll compressors, fans, condenser heat sink coil, expansion valves, solenoid valves, distribution headers, capillaries, filters, shutoff valves, oil separators, service ports, and refrigerant regulator.
3. Refrigerant: R-410a factory charged. Controller to alarm when charge is below capacity.
4. Variable Volume Control: Modulate compressed refrigerant capacity automatically to maintain constant suction and condensing pressures under varying refrigerant volume required to handle remote loads. Include defrost control.
5. Provide refrigerant subcooling to ensure the liquid refrigerant does not flash when supplying to use indoor units.
6. Capable of heating operation at low end of operating range as specified, without additional low ambient controls or auxiliary heat source; during heating operation, reverse cycle, oil return, or defrost is not permitted due to potential reduction in space temperature.
7. Power Failure Mode: Automatically restarts operation after power failure without loss of programmed settings.
8. Safety Devices: High pressure sensor with cut-out switch, low pressure sensor with cut-out switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, overcurrent protection for the inverter and antirecycling timers.
9. Oil Recovery Cycle: Automatic, occurring 2 hours after start of operation and then every 8 hours of operation; maintain continuous heating during oil return operation.

E. Local Controls:
1. Include factory-wired instruments, sensors, switches, and safeties for unit control.
2. Include screen and button interface to setup operating schedules, setpoints, alarms, and remote unit setpoint coordination. Also used for system troubleshooting.

F. Power:
1. Electrical Requirement: 208 to 230 VAC, 3-phase, 60 Hz.
2. Outdoor Mounted: Provide fused NEMA 250 Type 4X disconnect switch.

2.04 REFRIGERANT PIPING

A. Three-Pipe Run: Provide low-pressure vapor, high-pressure vapor gas, and liquid pipes for each indoor unit selected for off-season heating and cooling changeover service.

B. Refrigerant Flow Balancing: Provide refrigerant piping joints and headers specifically designed to ensure proper refrigerant balance and flow for optimum system capacity and performance; T-style joints are prohibited.

2.05 REFRIGERANT BRANCH UNITS

A. Outdoor unit interface to handle two or more indoor units required to do automatic off-season heating and cooling changeover.

B. Concealed box consisting internally-piped refrigeration loops, subcooling heat exchanger, and other devices coordinated by electronic valves to facilitate off-season load management between outdoor and indoor units.

C. Minimum Requirements:

1. Control direction of refrigerant flow using electronic expansion valves; use of solenoid valves for changeover and pressure equalization is not permitted due to refrigerant noise; use of multi-port branch selector boxes is not permitted unless spare ports are provided for redundancy.
2. Provide one electronic expansion valve for each downstream indoor unit served except when multiple indoor units are connected, provide balancing joints in downstream piping to keep total capacity within branch unit capacity.
3. Energize subcooling heat exchanger during simultaneous heating and cooling service.
4. Casing: Galvanized steel sheet with flame and heat resistant foamed polyethylene sound and thermal insulation.
5. Refrigerant Connections: Braze type.
6. Condensate Drainage: Provide unit that does not require condensate drainage.

2.06 INDOOR UNITS

A. Minimum Unit Requirements:

1. DX Evaporator Coil:
   a. Copper tubes expanded into aluminum fins to form a mechanical bond; waffle louver fin and high heat exchange, rifled bore tube design; factory tested.
   b. 2-, 3-, or 4-row cross fin design with 14 to 17 fins per inch and flare end-connections.
   c. Provide thermistor on liquid and gas lines wired into local controller.
   d. Refrigerant circuits factory-charged with dehydrated air for field charging.
2. Fan Section:
   a. Variable or three-speed ECM fan with automatic airflow adjustment; external static pressure selectable during commissioning.
   b. Thermally protected, direct-drive motor with statically and dynamically balanced fan blades.
   c. Minimum-adjustable external static pressure 0.32 in-wc; provide for mounting of field-installed ducts.
3. Local Unit Controls:
   a. Temperature Control: Return air control using thermistor tied to computerized Proportional-Integral-Derivative (PID) control of superheat.
   b. Temperature Zones:
      1) Single Indoor Unit: Set served space(s) as the local temperature zone.
      2) Multiple Indoor Units: For large zones, group and coordinate related indoor units with served spaces as the local temperature zone with each indoor unit as sub-zone.
4. Return Air Filter:
5. Condensate:
   a. Built-in condensate drain pan with PVC drain connection for drainage.

b. Units With Built-In Condensate Pumps: Provide condensate safety shutoff and alarm.
c. Units Without Built-In Condensate Pump: Provide built-in condensate float switch and wiring connections.

6. Cabinet Insulation: Sound absorbing foamed polystyrene and polyethylene insulation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that required electrical services have been installed and are in the proper locations prior to starting installation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install refrigerant piping in accordance with equipment manufacturer's instructions.
C. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).
D. Coordinate with installers of systems and equipment connecting to this system.
E. Refrigerant Piping: See Section 23-2300 with Section 23-0719 for insulation, and Section 23-0529 for hangers and supports unless following specific manufacturer recommendations.
F. Connect indoor units to condensate piping.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS for additional requirements.
B. Provide manufacturer's field representative to inspect installation prior to startup.

3.04 SYSTEM STARTUP

A. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.
B. Adjust equipment for proper operation within manufacturer's published tolerances.

3.05 CLEANING

A. Clean exposed components of dirt, finger marks, and other disfigurements.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01-7800 - CLOSEOUT SUBMITTALS for additional submittals.
B. See Section 01-7900 - DEMONSTRATION AND TRAINING for additional requirements.
C. Training: Train Owner's personnel on operation and maintenance of system.
    1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
    2. Provide minimum of one day of training.
    3. Instructor: Manufacturer's training personnel.
    4. Location: At project site.

3.07 PROTECTION

A. Protect installed components from subsequent construction operations.
B. Replace exposed components broken or otherwise damaged beyond repair.

3.08 MAINTENANCE

A. See Section 01-7000 - EXECUTION AND CLOSEOUT REQUIREMENTS for additional requirements.

END OF SECTION

SECTION 26-0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.
B. Metal-clad cable.
C. Wiring connectors.
D. Electrical tape.
E. Wire pulling lubricant.
F. Firestop sleeves.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
C. Wire Pulling Lubricant: Certification of compatibility with conductors/cables.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Metal-clad cable is permitted only as follows:
    1. Where not otherwise restricted, may be used:
        a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
            1) Maximum Length: 6 feet.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
D. Comply with NEMA WC 70.
E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
G. Conductor Material:
    1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
    2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
    3. Tinned Copper Conductors: Comply with ASTM B33.
H. Minimum Conductor Size:
    1. Branch Circuits: 12 AWG.
        a. Exceptions:
            1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
            2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
J. Conductor Color Coding:
    1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
    2. Color Coding Method: Integrally colored insulation.
        a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
    3. Color Code:
        a. 208Y/120 V, 3 Phase, 4 Wire System:
            1) Phase A: Black.
            2) Phase B: Red.
            3) Phase C: Blue.
            4) Neutral/Grounded: White.
        b. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.
B. Conductor Stranding:

1. Feeders and Branch Circuits:
    a. Size 10 AWG and Smaller: Solid.
    b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.

2.04 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

F. Armor: Aluminum or steel, interlocked tape.

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26-0526.

C. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

G. Mechanical Connectors: Provide bolted type or set-screw type.

H. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.06 ACCESSORIES

A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

B. Wire Pulling Lubricant:
   1. Listed and labeled as complying with UL 267.
   2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
   3. Suitable for use at installation temperature.

C. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.

D. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
   1. When circuit destination is indicated without specific routing, determine exact routing required.
   2. Arrange circuiting to minimize splices.
   3. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
   4. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
      a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
      b. Increase size of conductors as required to account for ampacity derating.
      c. Size raceways, boxes, etc. to accommodate conductors.
   5. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.
C. Perform work in accordance with NECA 1 (general workmanship).
D. Install metal-clad cable (Type MC) in accordance with NECA 120.
E. Installation in Raceway:
    1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
    2. Pull all conductors and cables together into raceway at same time.
    3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
    4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
H. Terminate cables using suitable fittings.
    1. Metal-Clad Cable (Type MC):
        a. Use listed fittings.
        b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
        c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.
I. Install conductors with a minimum of 12 inches of slack at each outlet.
J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
L. Make wiring connections using specified wiring connectors.
    1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
    2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
    3. Do not remove conductor strands to facilitate insertion into connector.
    4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
    5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
    6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
N. Insulate ends of spare conductors using vinyl insulating electrical tape.

O. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07-8400.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is only required for services and feeders. The resistance test for parallel conductors listed as optional is not required.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 26-0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.
B. Conductors for grounding and bonding.
C. Connectors for grounding and bonding.
D. Ground bars.
E. Ground rod electrodes.

1.02 RELATED REQUIREMENTS

A. Section 26-0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Additional requirements for conductors for grounding and bonding, including conductor color coding.
B. Section 26-0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS: Identification products and requirements.
C. Section 26-5600 - EXTERIOR LIGHTING: Additional grounding and bonding requirements for pole-mounted luminaires.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.04 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittals procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
      c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
   3. Concrete-Encased Electrode:
      a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
   4. Ground Rod Electrode(s):
      a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
      b. Space electrodes not less than 10 feet from each other and any other ground electrode.
      c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
   5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
   6. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
      a. Ground Bar Size: As shown on drawings unless otherwise indicated or required.
      b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
      c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

F. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
   a. Generators, when neutral is switched in the transfer switch.
2. Provide grounding electrode conductor to connect derived system grounded conductor to building grounding system. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
3. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

H. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

I. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
   a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
   b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.

c. Ground Bar Size: As shown on drawings unless otherwise indicated or required.
d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

J. Pole-Mounted Luminaires: Also comply with Section 26-5600.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26-0526:
1. Use insulated copper conductors unless otherwise indicated.
a. Exceptions:
1) Use bare copper conductors where installed underground in direct contact with earth.
2) Use bare copper conductors where directly encased in concrete (not in raceway).
2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gauge of specified conductors.

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors or compression connectors for accessible connections.

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
   1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

D. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26-0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 26-0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 26-0533.13 - CONDUIT FOR ELECTRICAL SYSTEMS: Additional support and attachment requirements for conduits.
B. Section 26-0533.16 - BOXES FOR ELECTRICAL SYSTEMS: Additional support and attachment requirements for boxes.
C. Section 26-5100 - INTERIOR LIGHTING: Additional support and attachment requirements for interior luminaires.
D. Section 26-5600 - EXTERIOR LIGHTING: Additional support and attachment requirements for exterior luminaires.
E. Section 27-0529 - Hangers and Supports for Communications Systems.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.
C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.
      b. Requirements of authorities having jurisdiction.

2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Metal Channel/Strut Framing Systems:
1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.
3. Channel Material:
    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install hangers and supports in accordance with NECA 1.
C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
G. Equipment Support and Attachment:
    1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
    2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls.
    3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
    4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
H. Conduit Support and Attachment: See Section 26-0533.13 for additional requirements.
I. Box Support and Attachment: See Section 26-0533.16 for additional requirements.
J. Interior Luminaire Support and Attachment: See Section 26-5100 for additional requirements.
K. Exterior Luminaire Support and Attachment: See Section 26-5600 for additional requirements.
L. Secure fasteners in accordance with manufacturer's recommended torque settings.
M. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS for additional requirements.
B. Inspect support and attachment components for damage and defects.
C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 26-0533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Galvanized steel intermediate metal conduit (IMC).
C. Flexible metal conduit (FMC).
D. Liquidtight flexible metal conduit (LFMC).
E. Galvanized steel electrical metallic tubing (EMT).
F. Rigid polyvinyl chloride (PVC) conduit.
G. Liquidtight flexible nonmetallic conduit (LFNC).

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittals procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
C. Underground:
   1. Under Slab on Grade: Use rigid PVC conduit.
   2. Exterior, Direct-Buried: Use rigid PVC conduit.

3. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) where emerging from underground.
4. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, galvanized steel intermediate metal conduit (IMC) elbows, or concrete-encased PVC elbows for bends.

D. Embedded Within Concrete:
1. Within Slab on Grade: Use galvanized steel electrical metallic tubing (EMT) or rigid PVC conduit. Embed within structural slabs only where approved by Structural Engineer.
2. Within Slab Above Ground: Not permitted.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC) or galvanized steel electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).

K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel electrical metallic tubing (EMT).

L. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
1. Maximum Length: 6 feet.

M. Flexible Connections to Vibrating Equipment:
1. Dry Locations: Use flexible metal conduit (FMC).
2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
3. Maximum Length: 6 feet unless otherwise indicated.

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Provide conduit, fittings, supports, and accessories required for complete raceway system.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 3/4-inch trade size.
2. Flexible Connections to Luminaires: 3/8-inch trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.07 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression/gland or set-screw type.
a. Do not use indenter type connectors and couplings.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.09 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

A. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.
B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for type of conduit to be connected.

2.10 ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
C. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.
D. Foam Conduit Sealant:
   1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
   2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
   3. Rated to hold minimum of 10 ft water head pressure.
E. Conduit Mechanical Seals:
   1. Listed as complying with UL 514B.
   2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.
   3. Suitable for sealing around conductors/cables to be installed.
F. Sealing Systems for Concrete Penetrations:
   1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
   2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that mounting surfaces are ready to receive conduits.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install conduit in accordance with NECA 1.
C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.

G. Conduit Routing:
   1. When conduit destination is indicated without specific routing, determine exact routing required.
   2. Conceal conduits unless specifically indicated to be exposed.
   3. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
   4. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   5. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
   6. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
   7. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
      a. Heaters.
      b. Hot water piping.

H. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26-0529.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
   4. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
   5. Use of wire for support of conduits is not permitted.

I. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
   3. Use suitable adapters where required to transition from one type of conduit to another.
   4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
   5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
   6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
   7. Secure joints and connections to provide mechanical strength and electrical continuity.

J. Penetrations:
   1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
8. Install firestopping to preserve fire resistance rating of partitions and other elements.

K. Underground Installation:
1. Provide trenching and backfilling; see Section 31-2316.13.
2. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 26-0553.

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

M. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
   a. Where conduits enter building from outside.
   b. Where service conduits enter building from underground distribution system.
   c. Where conduits enter building from underground.
   d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
   a. Where conduits pass from outdoors into conditioned interior spaces.
   b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

O. Provide grounding and bonding; see Section 26-0526.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 26-0533.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
C. Boxes and enclosures for integrated power, data, and audio/video.
D. Floor boxes.
E. Accessories.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
   5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
   6. Coordinate the work with other trades to preserve insulation integrity.
   7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
   8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for outlet and device boxes, cabinets and enclosures, and floor boxes.
C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    b. Communications Systems Outlets: Comply with Section 27-1000.
    c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
13. Wall Plates: Comply with Section 26-2726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may not be used.

E. Floor Boxes:
   1. Description: As called out on drawings; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.

2.02 ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that mounting surfaces are ready to receive boxes.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
G. Box Locations:
   1. Locate boxes to be accessible. Provide access panels in accordance with Section 08-3100 as required where approved by the Architect.
   2. Unless dimensioned, box locations indicated are approximate.
   3. Locate boxes as required for devices installed under other sections or by others.
      a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26-2726.
      b. Communications Systems Outlets: Comply with Section 27-1000.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
   6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
   8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
   9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26-0533.13.
   10. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:

a. Concealed above accessible suspended ceilings.
b. Within joists in areas with no ceiling.
c. Electrical rooms.
d. Mechanical equipment rooms.

H. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26-0529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

I. Install boxes plumb and level.

J. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

K. Install boxes as required to preserve insulation integrity.

L. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

M. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

N. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07-8400.

O. Close unused box openings.

P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

Q. Provide grounding and bonding in accordance with Section 26-0526.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26-0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.
B. Identification nameplates and labels.
C. Underground warning tape.
D. Warning signs and labels.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
B. Sequencing:
   1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
   2. Do not install identification products until final surface finishes and painting are complete.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittals procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Switchboards:
         1) Identify power source and circuit number. Include location when not within sight of equipment.
         2) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      b. Panelboards:
         1) Identify voltage and phase.
         2) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
         3) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

c. Enclosed switches, circuit breakers, and motor controllers:
1) Identify load(s) served. Include location when not within sight of equipment.
d. Transfer Switches:
1) Identify voltage and phase.
2) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

2. Service Equipment:
a. Use identification nameplate to identify each service disconnecting means.

3. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.

4. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
a. Service equipment.
b. Elevator control panels.

6. Arc Flash Hazard Warning Labels: Comply with Section 26-0573.

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26-0519.

C. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 27-1000.
2. Wiring Device and Wallplate Finishes: Comply with Section 26-2726.
3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
4. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Materials:
a. Indoor Clean, Dry Locations: Use plastic nameplates.
b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
a. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
a. Equipment Designation: 1/2 inch.
5. Color:
a. Normal Power System: White text on black background.

D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch by 2.5 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch.
5. Color: Black text on white background unless otherwise indicated.

E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches by 4 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch.
5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

2.03 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:
1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.04 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
1. Materials:

2. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
   3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Conductors and Cables: Legible from the point of access.
   8. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 26-0573 - POWER SYSTEM STUDIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Short-circuit study.
B. Protective device coordination study.
C. Arc flash and shock risk assessment.
    1. Includes arc flash hazard warning labels.
D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
    1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
    2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
B. Sequencing:
    1. Submit study reports prior to or concurrent with product submittals.
    2. Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Study reports, stamped or sealed and signed by study preparer.
C. Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.
    1. Identify modifications made in accordance with studies that:
        a. Can be made at no additional cost to Owner.
        b. As submitted will involve a change to the contract sum.
D. Arc Flash Hazard Warning Label Samples: One of each type and legend specified.
E. Project Record Documents: Revise studies as required to reflect as-built conditions.
    1. Include hard copies with operation and maintenance data submittals.
    2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

1.04 POWER SYSTEM STUDIES

A. Scope of Studies:
    1. Perform analysis of new electrical distribution system.
    2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
    3. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.
        a. Known Operating Modes:
            1) Utility as source.

2) Generator as source.

B. General Study Requirements:
1. Comply with NFPA 70.
2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:
1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
   a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
      1) Obtain up-to-date information from Utility Company.
      2) Utility Company: NPPD.
         (a) Point of Contact: Craig Vincent.
         (b) Address: 907 West 25th St, York NE 68467.
         (c) Phone: 402-366-7209.
         (d) Email: cavince@nppd.com.
   b. Generators: Include manufacturer/model, kW and voltage ratings, and impedance.
   c. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.
   d. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
   e. Protective Devices:
      1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
      2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
   f. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
   g. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Short-Circuit Study:
1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
   a. Maximum utility fault currents.
   b. Maximum motor contribution.
   c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Protective Device Coordination Study:

1. Comply with applicable portions of IEEE 242 and IEEE 399.
2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. Analyze protective devices and associated settings for suitable margins between time-current curves to provide adequate protection for equipment and conductors while achieving best possible coordination.

F. Arc Flash and Shock Risk Assessment:
1. Comply with NFPA 70E.
2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
   a. Maximum and minimum utility fault currents.
   b. Maximum and minimum motor contribution.
   c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

G. Study Reports:
1. General Requirements:
   a. Identify date of study and study preparer.
   b. Identify study methodology and software product(s) used.
   c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
   d. Identify base used for per unit values.
   e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
   f. Include conclusions and recommendations.
2. Short-Circuit Study:
   a. For each scenario, identify at each bus location:
      1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
      2) Fault point X/R ratio.
      3) Associated equipment short circuit current ratings.
   b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
3. Protective Device Coordination Study:
   a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
   b. For each graph include (where applicable):
      1) Partial single-line diagram identifying the portion of the system illustrated.
      2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
      3) Conductors: Damage curves.
      4) Transformers: Inrush points and damage curves.
      5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
      6) Motors: Full load current, starting curves, and damage curves.

7) Capacitors: Full load current and damage curves.

c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
   1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
   2) Include ground fault pickup and delay.
   3) Include fuse ratings.
   4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.

d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.

4. Arc Flash and Shock Risk Assessment:
   a. For the worst case for each scenario, identify at each bus location:
      1) Calculated incident energy and associated working distance.
      2) Calculated arc flash boundary.
      3) Bolted fault current.
      4) Arcing fault current.
      5) Clearing time.
      6) Arc gap distance.
   b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

1.05 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in State Name and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.
   1. Study preparer may be employed by manufacturer of electrical distribution equipment.

B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

PART 2 PRODUCTS

2.01 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
   1. Materials: Comply with Section 26-0553.
   2. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
      a. Include the following information:
         1) Arc flash boundary.
         2) Available incident energy and corresponding working distance.
         3) Nominal system voltage.

PART 3 EXECUTION

3.01 INSTALLATION

3.02 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.
C. Adjust equipment and protective devices for compliance with studies and recommended settings.
D. Notify Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.

3.03 CLOSEOUT ACTIVITIES

A. See Section 01-7800 - CLOSEOUT SUBMITTALS, for closeout submittals.

END OF SECTION

SECTION 26-2416 - PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.
B. Lighting and appliance panelboards.
C. Overcurrent protective devices for panelboards.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.
   2. Panelboard Keys: Two of each different key.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.06 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.electrification.us.abb.com/#sle.
B. Eaton Corporation: www.eaton.com/#sle.
C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
E. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
F. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.
B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26-0573.
   2. Listed series ratings are not acceptable.
D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
H. Conductor Terminations: Suitable for use with the conductors to be installed.
I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.

4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26-4300, list and label panelboards as a complete assembly including surge protective device.

L. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

M. Provide the following features and accessories where indicated or where required to complete installation:

1. Feed-through lugs.
2. Sub-feed lugs.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase and Neutral Bus Material: Aluminum or copper.
2. Ground Bus Material: Aluminum or copper.

D. Circuit Breakers:

1. Provide bolt-on type.

E. Enclosures:

1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum or copper.
3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
a. Provide mechanical lugs.
b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide the following circuit breaker types where indicated:
a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
b. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
7. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
8. Provide the following features and accessories where indicated or where required to complete installation:
a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

2.06 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
C. Verify that mounting surfaces are ready to receive panelboards.
D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.
C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
E. Provide required support and attachment in accordance with Section 26-0529.
F. Install panelboards plumb.
G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
J. Provide grounding and bonding in accordance with Section 26-0526.
K. Install all field-installed branch devices, components, and accessories.
L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
M. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26-0573.
N. Provide filler plates to cover unused spaces in panelboards.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Inspect and test in accordance with NETA ATS, except Section 4.
C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 150 amperes. Tests listed as optional are not required.
D. Test GFCI circuit breakers to verify proper operation.
E. Test AFCI circuit breakers to verify proper operation.
F. Test shunt trips to verify proper operation.
G. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
B. Adjust alignment of panelboard fronts.
C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26-2726 - WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.
B. Receptacles.
C. Wall plates.
D. Floor box service fittings.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.
B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
B. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
C. Provide GFCI protection for receptacles installed within 6 feet of sinks.
D. Provide GFCI protection for receptacles installed in kitchens.
E. Provide GFCI protection for receptacles serving electric drinking fountains.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.
B. Wiring Devices, Unless Otherwise Indicated: Gray with stainless steel wall plate.
C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

2.03 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.04 RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

C. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
   3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

D. USB Charging Devices:
   1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
      a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
      b. Charging Capacity - Four-Port Devices: 4.2 A, minimum.
   2. USB Charging Noncombination Devices: Four-port (Type A); rectangular decorator style.

2.05 WALL PLATES

A. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

D. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

2.06 FLOOR BOX SERVICE FITTINGS

A. Description: Service fittings compatible with floor boxes provided under Section 26-0533.16 with components, adapters, and trims required for complete installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
D. Verify that final surface finishes are complete, including painting.
E. Verify that floor boxes are adjusted properly.
F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.
B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
B. Coordinate locations of outlet boxes provided under Section 26-0533.16 as required for installation of wiring devices provided under this section.
    1. Mounting Heights: Unless otherwise indicated, as follows:
        a. Wall Switches: 48 inches above finished floor.
        b. Wall Dimmers: 48 inches above finished floor.
        c. Fan Speed Controllers: 48 inches above finished floor.
        d. Receptacles: 18 inches above finished floor or 6 inches above counter.
C. Install wiring devices in accordance with manufacturer's instructions.
D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
H. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
J. Install wall switches with OFF position down.
K. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on right.
L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
N. Identify wiring devices in accordance with Section 26-0553.

3.04 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Inspect each wiring device for damage and defects.
C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
D. Test each receptacle to verify operation and proper polarity.
E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26-2813 - FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
      a. Fusible Enclosed Switches: See Section 26-2816.16.
   2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. General Purpose Branch Circuits: Class RK1, time-delay.
B. Individual Motor Branch Circuits: Class RK1, time-delay.
C. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.

2.02 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.
B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
C. Provide fuses of the same type, rating, and manufacturer within the same switch.
D. Comply with UL 248-1.
E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
F. Voltage Rating: Suitable for circuit voltage.
G. Class R Fuses: Comply with UL 248-12.
H. Class J Fuses: Comply with UL 248-8.
I. Class CC Fuses: Comply with UL 248-4.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.
B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 26-2816.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.06 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.electrification.us.abb.com/#sle.
B. Eaton Corporation: www.eaton.com/#sle.
C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

E. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
    1. Altitude: Less than 6,600 feet.
    2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
D. Horsepower Rating: Suitable for connected load.
E. Voltage Rating: Suitable for circuit voltage.
F. Short Circuit Current Rating:
G. Provide with switch blade contact position that is visible when the cover is open.
H. Conductor Terminations: Suitable for use with the conductors to be installed.
I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
    1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
L. Heavy Duty Switches:
    1. Comply with NEMA KS 1.
    2. Conductor Terminations:
        a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
    3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
C. Verify that mounting surfaces are ready to receive enclosed safety switches.
D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
D. Provide required support and attachment in accordance with Section 26-0529.
E. Install enclosed switches plumb.
F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26-0526.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Inspect and test in accordance with NETA ATS, except Section 4.
C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26-2913 - ENCLOSED CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:
   1. Magnetic motor starters.
   2. Manual motor starters.
   3. Motor-starting switches without overload protection.

B. Overcurrent protective devices for motor controllers, including overload relays.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate the work to provide motor controllers and associated overload relays suitable for use with the actual motors to be installed.
   3. Coordinate the work to provide controllers and associated wiring suitable for interface with control devices to be installed.
   4. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   5. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   6. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

1.06 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB/GE: www.electrification.us.abb.com/#sle.
B. Eaton Corporation: www.eaton.com/#sle.
C. Rockwell Automation, Inc; Allen-Bradley Products: ab.rockwellautomation.com/#sle.
D. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
E. Siemens Industry, Inc: www.usa.siemens.com/#sle.
F. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

2.02 ENCLOSED CONTROLLERS

A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.
D. Service Conditions:
    1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
        a. Altitude:
            1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet.
            2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet.
        b. Ambient Temperature: Between 32 degrees F and 104 degrees F.
    2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
E. Short Circuit Current Rating:
    1. Provide controllers with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26-0573.
F. Conductor Terminations: Suitable for use with the conductors to be installed.
G. Enclosures:
    1. Comply with NEMA ICS 6.
    2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    3. Finish: Manufacturer's standard unless otherwise indicated.
H. Instrument Transformers:
    1. Comply with IEEE C57.13.
    2. Select suitable ratio, burden, and accuracy as required for connected devices.
    3. Current Transformers: Connect secondaries to shorting terminal blocks.
    4. Potential Transformers: Include primary and secondary fuses with disconnecting means.
I. Magnetic Motor Starters: Combination type unless otherwise indicated.

1. Combination Magnetic Motor Starters: NEMA ICS 2, Class A combination motor controllers with magnetic contactor(s), externally operable disconnect and overload relay(s).
2. Configuration: Full-voltage non-reversing unless otherwise indicated.
3. Disconnects: Disconnect switch type.
    a. Disconnect Switches: Fusible type unless otherwise indicated.
    b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
    c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
4. Overload Relays: Bimetallic thermal type unless otherwise indicated.

J. Manual Motor Starters:
1. Description: NEMA ICS 2, Class A manually-operated motor controllers with overload relay(s).
2. Configuration: Non-reversing unless otherwise indicated.
3. Fractional-Horsepower Manual Motor Starters:
    a. Furnish with toggle operator.
    b. Overload Relays: Bimetallic or melting alloy thermal type.
4. Integral-Horsepower Manual Motor Starters:
    a. Furnish with toggle or pushbutton operator.
    b. Overload Relays: Bimetallic or melting alloy thermal type.

K. Motor-Starting Switches: Horsepower-rated switches without overload protection; toggle operator.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Overload Relays:
1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
3. Trip-free operation.
4. Visible trip indication.
5. Resettable.
    a. Employ manual reset unless otherwise indicated.
    b. Do not employ automatic reset with two-wire control.
6. Bimetallic Thermal Overload Relays:
    a. Interchangeable current elements/heaters.
    b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
    c. Trip test function.
7. Melting Alloy Thermal Overload Relays:
    a. Interchangeable current elements/heaters.

B. Fusible Disconnect Switches:
1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.

2. Fuse Clips: As required to accept indicated fuses.
3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

2.04 CONTROL ACCESSORIES

A. Auxiliary Contacts:
   1. Comply with NEMA ICS 5.
   2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each magnetic motor starter, minimum.

B. Pilot Devices:
   1. Comply with NEMA ICS 5; heavy-duty type.
   2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
   3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
   4. Indicating Lights: Push-to-test type unless otherwise indicated.
   5. Provide LED lamp source for indicating lights and illuminated devices.

C. Control and Timing Relays:
   1. Comply with NEMA ICS 5.
   2. Provide number and type of relays indicated or required to perform necessary functions.

D. Control Power Transformers:
   1. Size to accommodate burden of contactor coil(s) and all connected auxiliary devices.
   2. Include primary and secondary fuses.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that ratings of enclosed controllers are consistent with the indicated requirements.
C. Verify that mounting surfaces are ready to receive enclosed controllers.
D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install controllers in accordance with NECA 1 (general workmanship).
C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
D. Provide required support and attachment in accordance with Section 26-0529.
E. Install enclosed controllers plumb and level.
F. Provide grounding and bonding in accordance with Section 26-0526.
G. Install all field-installed devices, components, and accessories.
H. Provide fuses complying with Section 26-2813 for fusible switches as indicated.
I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

J. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Inspect and test in accordance with NETA ATS, except Section 4.
C. Motor Starters: Perform inspections and tests listed in NETA ATS, Section 7.16.1.1. Tests listed as optional are not required.
D. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
E. Correct deficiencies and replace damaged or defective enclosed controllers or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.
B. Repair scratched or marred exterior surfaces to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01-7800 - CLOSEOUT SUBMITTALS, for closeout submittals.

3.07 PROTECTION

A. Protect installed enclosed controllers from subsequent construction operations.

END OF SECTION

SECTION 26-3213 - ENGINE GENERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:
   1. Engine and engine accessory equipment.
   2. Alternator (generator).
   3. Generator set control system.
   4. Generator set enclosure.

1.02 RELATED REQUIREMENTS

A. Section 03-3000 - CAST-IN-PLACE CONCRETE: Concrete equipment pads.
B. Section 26-0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
C. Section 26-0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.
D. Section 26-0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS: Identification products and requirements.
E. Section 26-3600 - TRANSFER SWITCHES.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.
B. NECA/EGSA 404 - Standard for Installing Generator Sets.
C. NEMA MG 1 - Motors and Generators.
D. NFPA 30 - Flammable and Combustible Liquids Code.
E. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines.
F. NFPA 70 - National Electrical Code.
G. NFPA 99 - Health Care Facilities Code.
H. NFPA 110 - Standard for Emergency and Standby Power Systems.
I. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries.
J. UL 2200 - Stationary Engine Generator Assemblies.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
      a. Transfer Switches: See Section 26-3600.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.
   1. Include generator set sound level test data.
C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
D. Manufacturer's factory emissions certification.
E. Source quality control test reports.
F. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:
   1. Certified prototype tests.
   2. Torsional vibration compatibility certification.
   3. NFPA 110 compliance certification.
   4. Certified rated load test at rated power factor.
G. Manufacturer’s detailed field testing procedures.
H. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
   1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
I. Maintenance contracts.
J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.
   2. Extra Filter Elements: One of each type, including fuel, oil and air.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 2 system.
   3. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).
   4. NFPA 30 (Flammable and Combustible Liquids Code).
B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.
B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01-7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Packaged Engine Generator Set:
   1. Caterpillar Inc: www.cat.com/#sle.
   2. Cummins Power Generation Inc: www.cumminspower.com/#sle.
   3. Generac Power Systems: www.generac.com/industrial/#sle.
   4. Kohler Co: www.kohlerpower.com/#sle.
   5. MTU Onsite Energy, a Brand of Rolls-Royce Power Systems: www.mtuonsiteenergy.com/#sle.

B. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.

2.02 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. System Description:
   1. Application: Optional Standby.
   2. Configuration: Single packaged engine generator set operated independently (not in parallel).

D. Packaged Engine Generator Set:
   1. Type: Gaseous (spark ignition).
   2. Power Rating: As indicated on drawings, standby.
   3. Voltage: As indicated on drawings.
   4. Main Line Circuit Breaker:
      a. Type: Thermal magnetic.
      b. Trip Rating: As indicated on drawings.

E. Generator Set General Requirements:
   1. Prototype tested in accordance with NFPA 110 for Level 2 systems.
   2. Factory-assembled, with components mounted on suitable base.
   3. List and label engine generator assembly as complying with UL 2200.
   4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
   5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
   6. Main Line Circuit Breakers: Provide factory-installed line side connections with suitable lugs for load side connections.

F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.

G. Starting and Load Acceptance Requirements:

1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
4. Maximum Load Step: Supports 100 percent of rated load in one step.

H. Exhaust Emissions Requirements:
1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

2.03 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.

B. Engine Fuel System - Gaseous (Spark Ignition):
1. Fuel Source: Natural gas.
2. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
3. Provide components/features indicated and as necessary for operation and/or required by applicable codes, including but not limited to:
a. Carburetor.
b. Gas pressure regulators.
c. Fuel shutoff control valves.
d. Low gas pressure switches.

C. Engine Starting System:
1. System Type: Electric, with DC solenoid-activated starting motor(s).
2. Battery(s):
a. Battery Type: Lead-acid.
b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
4. Battery Charger:
a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours while carrying normal loads.

c. Recognized as complying with UL 1236.
d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
f. Provide alarm output contacts as necessary for alarm indications.

5. Battery Heater: Provide thermostatically controlled battery heater to improve starting under cold ambient conditions.

D. Engine Speed Control System (Governor):
1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:
1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.

F. Engine Cooling System:
1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.
3. Coolant Heater: Provide thermostatically controlled coolant heater to improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.

G. Engine Air Intake and Exhaust System:
1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.
3. Exhaust Silencer: Provide critical grade or better exhaust silencer; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

2.04 ALTERNATOR (GENERATOR)

A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.

B. Exciter:
1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.

C. Temperature Rise: Comply with UL 2200.

D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.

E. Enclosure: NEMA MG 1, drip-proof.

F. Total Harmonic Distortion: Not greater than five percent.
G. Alternator Heater: Provide strip heater to prevent moisture condensation on alternator windings.

2.05 GENERATOR SET CONTROL SYSTEM

A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.
B. Control Panel:
    1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
    2. Generator Set Control Functions:
        a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
        b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
        c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
        d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
        e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
        f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
        g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
    3. Generator Set Status Indications:
        a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
        b. Current (Amps): For each phase.
        c. Frequency (Hz).
        d. Real power (W/kW).
        e. Reactive power (VAR/kVAR).
        f. Apparent power (VA/kVA).
        g. Power factor.
        h. Duty Level: Actual load as percentage of rated power.
        i. Engine speed (RPM).
        j. Battery voltage (Volts DC).
        k. Engine oil pressure.
        l. Engine coolant temperature.
        m. Engine run time.
        n. Generator powering load (position signal from transfer switch).
    4. Generator Set Protection and Warning/Shutdown Indications:
        a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
            1) Overcrank (shutdown).
            2) Low coolant temperature (warning).
            3) High coolant temperature (warning).
            4) High coolant temperature (shutdown).
            5) Low oil pressure (shutdown).
            6) Overspeed (shutdown).
            7) Low fuel level (warning).
            8) Low coolant level (warning/shutdown).

9) Generator control not in automatic mode (warning).
10) High battery voltage (warning).
11) Low cranking voltage (warning).
12) Low battery voltage (warning).
13) Battery charger failure (warning).

b. In addition to NFPA 110 requirements, provide the following protections/indications:
1) High AC voltage (shutdown).
2) Low AC voltage (shutdown).
3) High frequency (shutdown).
4) Low frequency (shutdown).
5) Overcurrent (shutdown).

c. Provide contacts for local and remote common alarm.

d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:
a. Event log.

C. Remote Annunciator:
1. Remote Annunciator Mounting: Wall-mounted; Provide flush-mounted annunciator for finished areas and surface-mounted annunciator for non-finished areas unless otherwise indicated.
2. Generator Set Status Indications:
a. Generator powering load (via position signal from transfer switch).
b. Communication functional.
3. Generator Set Warning/Shutdown Indications:
a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following indications:
1) Overcrank (shutdown).
2) Low coolant temperature (warning).
3) High coolant temperature (warning).
4) High coolant temperature (shutdown).
5) Low oil pressure (shutdown).
6) Overspeed (shutdown).
7) Low fuel level (warning).
8) Low coolant level (warning/shutdown).
9) Generator control not in automatic mode (warning).
10) High battery voltage (warning).
11) Low cranking voltage (warning).
12) Low battery voltage (warning).
13) Battery charger failure (warning).

b. Provide audible alarm with silence function.

c. Provide lamp test function that illuminates all indicator lamps.

D. Remote Emergency Stop: Provide approved red, mushroom style remote emergency stop button where indicated or required by authorities having jurisdiction.

2.06 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.

B. Enclosure Material: Steel or aluminum.

C. Hardware Material: Stainless steel.

D. Color: Manufacturer's standard.
E. Access Doors: Lockable, with all locks keyed alike.
F. Openings: Designed to prevent bird/rodent entry.
G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.
H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.
I. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

2.07 SOURCE QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.
C. Verify that rough-ins for field connections are in the proper locations.
D. Verify that mounting surfaces are ready to receive equipment.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.
C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.
D. Arrange equipment to provide minimum clearances and required maintenance access.
E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch high concrete pad constructed in accordance with Section 03-3000.
F. Provide required support and attachment in accordance with Section 26-0529.
G. Provide required vibration isolation and/or seismic controls in accordance with Section 26-0548.
H. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.
I. Provide engine exhaust piping in accordance with Section 23-5100, where not factory installed.
    1. Include piping expansion joints, piping insulation, thimble, condensation trap/drain, rain cap, hangers/supports, etc. as indicated or as required.
    2. Do not exceed manufacturer's maximum back pressure requirements.
J. Install exhaust silencer in accordance with Section 23-5100, where not factory installed.
K. Provide grounding and bonding in accordance with Section 26-0526.
L. Identify system wiring and components in accordance with Section 26-0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.

B. Provide services of a manufacturer's authorized representative to prepare and start systems and perform inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.
C. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.
D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
E. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.
F. Preliminary inspection and testing to include, at a minimum:
    1. Inspect each system component for damage and defects.
    2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
    3. Check for proper oil and coolant levels.
G. Prepare and start system in accordance with manufacturer's instructions.
H. Perform acceptance test in accordance with NFPA 110.
I. Provide field emissions testing where necessary for certification.
J. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.
B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
    1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
    2. Instructor: Manufacturer's authorized representative.
    3. Location: At project site.
C. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters and fill fuel storage tank.

3.06 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

3.07 MAINTENANCE

A. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of engine generator system for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.
B. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.
C. Provide trouble call-back service upon notification by Owner:
    1. Provide on-site response within 4 hours of notification.

2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

D. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

END OF SECTION

SECTION 26-3600 - TRANSFER SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
   1. Automatic transfer switches.
   2. Includes service entrance rated transfer switches.

1.02 RELATED REQUIREMENTS

A. Section 03-3000 - CAST-IN-PLACE CONCRETE: Concrete equipment pads.
B. Section 26-0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
C. Section 26-0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.
D. Section 26-0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS: Identification products and requirements.
E. Section 26-0573 - POWER SYSTEM STUDIES: Additional criteria for the selection of equipment specified in this section.
F. Section 26-3213 - ENGINE GENERATORS: For interface with transfer switches.
   1. Includes code requirements applicable to work of this section.
   2. Includes related demonstration and training requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.
B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
C. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment.
D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.
E. NFPA 70 - National Electrical Code.
F. NFPA 110 - Standard for Emergency and Standby Power Systems.
G. UL 869A - Reference Standard for Service Equipment.
H. UL 1008 - Transfer Switch Equipment.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
      a. Engine Generators: See Section 26-3213.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
B. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.

1.05 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.
C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
D. Manufacturer's certification that products meet or exceed specified requirements.
E. Source quality control test reports.
F. Manufacturer’s detailed field testing procedures.
G. Maintenance contracts.
H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.

1.06 QUALITY ASSURANCE

A. Comply with the following:
    1. NFPA 70 (National Electrical Code).
    2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 26-3213.
B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.
B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01-7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Transfer Switches:
    1. Same as manufacturer of engine generator(s) used for this project.
B. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

2.02 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Applications:
   1. Utilize open transition transfer unless otherwise indicated or required.
   2. Neutral Switching (Single Phase, Three Wire and Three Phase, Four Wire Systems):
      a. Unless otherwise indicated or required, provide neutral switching:
         1) Where the alternate/emergency source is a separately derived system.

D. Construction Type: Only "breaker type" (enclosed contact) transfer switches are acceptable. Do not use "contactor type" (open contact) transfer switches.

E. Automatic Transfer Switch:
   1. Voltage: As indicated on the drawings.
   2. Ampere Rating: As indicated on the drawings.
   3. Neutral Configuration: Switched neutral.
   4. Primary Source: As indicated on the drawings.
   5. Alternate Source: As indicated on the drawings.

F. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

I. Switching Methods:
   1. Open Transition:
      a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
   2. Neutral Switching: Either simultaneously switched neutral (break-before-make) or overlapping neutral (make-before-break) methods are acceptable.
   3. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.

K. Enclosures:
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1 or Type 12.
      b. Outdoor Locations: Type 3R or Type 4.
   2. Provide lockable door(s) for outdoor locations.
   3. Finish: Manufacturer's standard unless otherwise indicated.

L. Short Circuit Current Rating:

1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26-0573.

M. Automatic Transfer Switches:
   1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
   2. Control Functions:
      a. Automatic mode.
      b. Test Mode: Simulates failure of primary/normal source.
      c. Voltage and Frequency Sensing:
         1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
         2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
         3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.
      d. Outputs:
         1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
         2) Auxiliary contacts; one set(s) for each switch position.
         3) Signal before transfer (load disconnect) contacts; for selective load disconnection prior to transfer.
      e. Adjustable Time Delays:
         1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
         2) Transfer to alternate/emergency source time delay.
         3) Retransfer to primary/normal source time delay.
         4) Signal before transfer (load disconnect) contact time delay.
         5) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.
      f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.
      g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.
   3. Status Indications:
      a. Connected to alternate/emergency source.
      b. Connected to primary/normal source.
      c. Alternate/emergency source available.
   4. Automatic Sequence of Operations:
      a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
      b. Where applicable, initiate signal before transfer (load disconnect) contacts at programmable time before transfer.

c. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
d. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
e. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

N. Service Entrance Rated Transfer Switches:
1. Furnished with integral disconnecting and overcurrent protective device on the primary/normal source and with ground-fault protection where indicated.
2. Listed and labeled as suitable for use as service equipment according to UL 869A.

O. Interface with Other Work:
1. Interface with engine generators as specified in Section 26-3213.
2. Interface with elevators.
a. Utilize signal before transfer contacts to disconnect elevator(s) served prior to transfer.
3. Interface with building automation system.

2.03 SOURCE QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Perform production tests on transfer switches at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.
C. Verify that rough-ins for field connections are in the proper locations.
D. Verify that mounting surfaces are ready to receive transfer switches.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.
C. Arrange equipment to provide minimum clearances and required maintenance access.
D. Provide required support and attachment in accordance with Section 26-0529.
E. Install transfer switches plumb and level.
F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch high concrete pad constructed in accordance with Section 03-3000.
G. Provide grounding and bonding in accordance with Section 26-0526.
H. Identify transfer switches and associated system wiring in accordance with Section 26-0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Prepare and start system in accordance with manufacturer's instructions.
C. Automatic Transfer Switches:

1. Inspect and test in accordance with NETA ATS, except Section 4.
2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.

D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01-7800 - CLOSEOUT SUBMITTALS, for closeout submittals.

B. Demonstration: Demonstrate proper operation of transfer switches to Owner, and correct deficiencies or make adjustments as directed.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of transfer switches.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Instructor: Manufacturer's authorized representative.
3. Location: At project site.

D. Coordinate with related generator demonstration and training as specified in Section 26-3213.

3.06 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

3.07 MAINTENANCE

A. See Section 01-7000 - EXECUTION AND CLOSEOUT REQUIREMENTS, for additional requirements relating to maintenance service.

B. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of transfer switches for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

C. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

D. Provide trouble call-back service upon notification by Owner:

1. Provide on-site response within 4 hours of notification.
2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

END OF SECTION

SECTION 26-4100 – LIGHTNING PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Work included: Provide complete lightning protection system:
   1. Air terminals and interconnecting conductors.
   2. Grounding and bonding for lightning protection.
B. Related Documents: The Contract Documents, as defined in Division 01 Section "Summary of Work", apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

1.02 REFERENCES

A. Lightning Protection Institute (LPI):
   1. LPI-175 - Lightning Protection Installation Standard.
   2. LPI-176 - Lightning Protection System Material and Components Standard.
   3. LPI-177 - Inspection Guide for LPI Certified Systems.
B. National Fire Protection Association (NFPA):
   1. NFPA 780 - Lightning Protection Code.
C. Underwriters Laboratories, Inc. (UL):
   1. UL 96 - Lightning Protection Components.
   2. UL 96A - Installation Requirements for Lightning Protection Systems.

1.03 SYSTEM DESCRIPTION

A. Design Requirements: Lightning protection conductor system consisting of air terminals on roofs, roof-mounted equipment, parapets, bonding of structure and other metal objects; grounding electrodes; and interconnecting conductors.

1.04 SUBMITTALS

A. Division 01 Section - "Submittal Procedures": Procedures for submittals.
   1. Product Data: Provide dimensions and materials of each component, and include indication of listing in accordance with UL 96.
   2. Shop Drawings: Indicate layout of air terminals, grounding electrodes, and bonding connections to structure and other metal objects. Include terminal, electrode, and conductor sizes, and connection and termination details. Grounding cable shall not be routed exposed down side of building. Cable must penetrate roof through a hooded pan, or approved SMACNA enclosure.
   3. Assurance/Control Submittals:
      a. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
      b. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.
B. Division 01 Section - "Closeout Submittals": Procedures for closeout submittals.
   1. Project Record Documents: Accurately record the following:
      a. Actual locations of air terminals, grounding electrodes, bonding connections, and routing of system conductors in project record documents.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 780.
B. Perform Work in accordance with UL 96A and provide Master Label for portion of building.
C. Perform Work in accordance with LPI-175 and provide LPI Certification.
D. The lightning protection system shall conform to the requirements of the Lightning Protection Institute, National Fire Protection Association and Underwriters Laboratories, Inc. standards for lightning protection systems. Upon completion, application shall be made to the Underwriters' Laboratories, Inc. and the Lightning Protection Institute for inspection and certification.
E. The system to be furnished shall be the standard product of a manufacturer regularly engaged in the production of lightning protection systems and shall be manufacturers latest approved design. The equipment manufacturer shall also be a U.L. listed manufacturer and a fully certified manufacturer member in good standing of the Lightning Protection Institute.
F. Qualifications:
    1. Manufacturer: Company specializing in manufacturing Products specified with minimum 5 years documented experience and member of Lightning Protection Institute.
    2. Installer: Company specializing in performing the Work of this Section with minimum 5 years documented experience, certified by manufacturer as an "Approved Installer," and certified by Lightning Protection Institute.
G. Regulatory Requirements
    1. Product Listing: UL 96 and LPI-176.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturer's offering Products which may be incorporated in the Work include the following:
    1. Heary Brothers Lightning Protection Company.
    2. Thompson Lightning Protection Company.
    3. Bonded Lightning Protection Company.
B. Division 01 Section - "Product Requirements": Product options and substitutions. Substitutions: Permitted.

2.02 COMPONENTS

A. Aluminum materials may not be used except on roofs that require aluminum components in order to be compatible with aluminum roofing materials.
B. Air Terminals: Copper.
C. Grounding Rods: Copper-Clad.
D. Ground Plate: Copper.
E. Conductors: Copper.
F. Connectors and Splicers: Bronze.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Division 01 Section - "Execution Requirements": Verification of existing conditions before starting work.
B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 INSTALLATION

A. The installation shall be accomplished by an experienced installation company that is U.L. listed, a member of the Lightning Protection Institute, and an employer of Certified Master Installers of Lightning Protection Systems. A LPI Certified Master Installer shall directly supervise the work.
B. Install in accordance with NFPA 780, UL 96A, and LPI-175.
C. All equipment shall be installed in a neat, workmanlike manner.
D. Connect conductors using exothermic welding process. Protect adjacent construction elements and finishes from damage.
E. Bond exterior metal bodies on building to lightning protection system, and provide intermediate level interconnection loops 60 feet on center.
F. Contractor shall not run cables down the exterior of the building. Grounding cables shall be routed through the roof. All roof penetrations shall utilize a hooded pan. Reference architectural roof details.

3.03 CONSTRUCTION

A. Interface with Other Work: Coordinate Work with roofing and interior finish installations.

3.04 FIELD QUALITY CONTROL

A. Division 01 Section - "Quality Control": Field testing and inspection.
B. Perform inspection and testing in accordance with LPI-177.

END OF SECTION 26 41 00

SECTION 26-4300 - SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surge protective devices for service entrance locations.
B. Surge protective devices for branch panelboard locations.

1.02 RELATED REQUIREMENTS

A. Section 26-0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
B. Section 26-2416 - PANELBOARDS.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction.
B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
C. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems.
D. NFPA 70 - National Electrical Code.
E. UL 1283 - Standard for Electromagnetic Interference Filters.
F. UL 1449 - Standard for Surge Protective Devices.

1.04 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.
C. Certificates: Manufacturer's documentation of listing for compliance with the following standards:
    1. UL 1449.
    2. UL 1283 (for Type 2 SPDs).
D. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.
E. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.07 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

A. See Section 01-7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Factory-installed, Internally Mounted Surge Protective Devices:
   1. Same as manufacturer of equipment containing surge protective device, to provide a complete listed assembly including SPD.

2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.
B. Unless otherwise indicated, provide factory-installed, internally-mounted SPDs.
C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.
D. Protected Modes:
   1. Wye Systems: L-N, L-G, N-G, L-L.
E. UL 1449 Voltage Protection Ratings (VPRs):
   1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
G. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   1. Indoor clean, dry locations: Type 1.
H. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.
   1. Panelboards: See Section 26-2416.

2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

A. Surge Protective Device:
   1. Protection Circuits: Field-replaceable modular or non-modular.
   2. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.
   3. Repetitive Surge Current Capacity: Not less than 5,000 impulses.
   4. UL 1449 Nominal Discharge Current (I-n): 20 kA.
   5. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
   6. Diagnostics:
      a. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.
      b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

2.04 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

A. Surge Protective Device:
   1. Protection Circuits: Field-replaceable modular or non-modular.
   2. Surge Current Rating: Not less than 60 kA per mode/120 kA per phase.
   3. Repetitive Surge Current Capacity: Not less than 2,000 impulses.
   4. UL 1449 Nominal Discharge Current (I-n): 20 kA.
   5. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
   6. Diagnostics:
      a. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
      b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify system grounding and bonding is in accordance with Section 26-0526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.
B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).
B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
C. Unless indicated otherwise, connect service entrance surge protective device on load side of service disconnect main overcurrent device.
D. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26-0526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.
E. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Perform inspections and tests listed in NETA ATS Section 7.19.1.

3.04 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26-5100 - INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.
B. Emergency lighting units.
C. Exit signs.
D. Accessories.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
   2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
   4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.06 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.07 WARRANTY

A. See Section 01-7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.
B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.
C. Provide 5-year pro-rata warranty for batteries for emergency lighting units.

D. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.
B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
C. Provide products listed, classified, and labeled as suitable for the purpose intended.
D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
G. Recessed Luminaires:
    1. Ceiling Compatibility: Comply with NEMA LE 4.
H. LED Luminaires:
    1. Components: UL 8750 recognized or listed as applicable.
    2. Tested in accordance with IES LM-79 and IES LM-80.
    3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
C. Battery:
    1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
E. Provide low-voltage disconnect to prevent battery damage from deep discharge.
F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

2.04 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
    1. Number of Faces: Single- or double-face as indicated or as required for installed location.

2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
   1. Self-Powered Exit Signs:
      a. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
      b. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
      c. Provide low-voltage disconnect to prevent battery damage from deep discharge.
      d. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

2.05 ACCESSORIES

A. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
C. Verify that suitable support frames are installed where required.
D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.
B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26-0533.16 as required for installation of luminaires provided under this section.
B. Install products in accordance with manufacturer's instructions.
C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
D. Provide required support and attachment in accordance with Section 26-0529.
E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
F. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
   4. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.

5. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.

H. Suspended Luminaires:
   1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
   2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. Emergency Lighting Units:

M. Exit Signs:

N. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 26-5600 - EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.
B. Poles and accessories.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
   2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
   2. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.
C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01-6000 - PRODUCT REQUIREMENTS, for additional provisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.06 WARRANTY

A. Provide 2-year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.
B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.03 POLES

A. All Poles:
   1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
   2. Material: Steel, unless otherwise indicated.
   3. Shape: Square straight, unless otherwise indicated.
   4. Finish: Match luminaire finish, unless otherwise indicated.
   5. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
   6. Unless otherwise indicated, provide with the following features/accessories:
      a. Handhole.
      b. Anchor bolts with leveling nuts or leveling shims.
      c. Anchor base cover.
B. Metal Poles: Provide ground lug, accessible from handhole.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
C. Verify that suitable support frames are installed where required.
D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.
B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26-0533.16 as required for installation of luminaires provided under this section.
B. Install products in accordance with manufacturer's instructions.
C. Install luminaires in accordance with NECA/IESNA 501.
D. Provide required support and attachment in accordance with Section 26-0529.
E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
F. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.

G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
H. Pole-Mounted Luminaires:
    1. Foundation-Mounted Poles:
        a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03-3000.
            1) Install anchor bolts plumb per template furnished by pole manufacturer.
            2) Position conduits to enter pole shaft.
        b. Install foundations plumb.
        c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
        d. Tighten anchor bolt nuts to manufacturer's recommended torque.
        e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
        f. Install anchor base covers or anchor bolt covers as indicated.
    2. Grounding:
        a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
        b. Provide supplementary ground rod electrode as specified in Section 26-0526 at each pole bonded to grounding system as indicated.
    3. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
    4. Install non-breakaway in-line fuse holders and fuses complying with Section 26-2813 in pole handhole or transformer base for each ungrounded conductor.
I. Install accessories furnished with each luminaire.
J. Bond products and metal accessories to branch circuit equipment grounding conductor.

3.04 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Inspect each product for damage and defects.
C. Operate each luminaire after installation and connection to verify proper operation.
D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

3.06 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01-7800 - CLOSEOUT SUBMITTALS, for closeout submittals.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 27-0529 - HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other communications work.

1.02 RELATED REQUIREMENTS

A. Section 26-0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.
B. Section 27-0533.13 - Conduit for Communications Systems: Additional support and attachment requirements for conduits.
C. Section 27-1000 - STRUCTURED CABLING.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cable supports, channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
    1. Comply with the following. Where requirements differ, comply with most stringent.
        a. TIA-569.
        b. NFPA 70.
        c. Requirements of authorities having jurisdiction.
    2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of communications work.
    3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
    4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
    5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
    6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
    7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
        a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
        b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
        c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
        d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit Supports: Straps and clamps suitable for conduit to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.
C. Cable Supports: Suitable for cables to be supported, including but not limited to J-hooks, bridle rings, drive rings, and flexible harnesses/slings.
   1. Applications:
      a. Do not exceed 5 feet between cable supports.
      b. Maximum Number of Cables per Cable Support:
      c. Allowable Cable Types:
         1) J-Hooks: Category 3, Category 5e, and Category 6.
         2) Bridle Rings without Saddle: Category 3.
         3) Bridle Rings with Saddle: Category 3, Category 5e, and Category 6.
   2. Comply with TIA-569.
   3. Cable Supports Installed in Spaces Used for Environmental Air: Plenum rated; listed and labeled as complying with UL 2043, suitable for use in air-handling spaces.
   4. J-Hooks: Noncontinuous cabling support with removable top retainer clip.
      a. Material: Use galvanized steel, factory-painted steel, or stainless steel.
      b. Provide support surfaces with smooth, beveled edges and radius not less than minimum allowable bend radius of cables supported.
      c. Provide multitiered J-hooks where required to support multiple cabling systems.
   5. Bridle rings: Noncontinuous circular cabling support.
      a. Material: Use galvanized steel, painted steel, or stainless steel.
      b. Provide integral saddle with smooth, beveled edges and radius not less than minimum allowable bend radius of cables supported where indicated.
D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
E. Metal Channel/Strut Framing Systems:
   1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
   2. Comply with MFMA-4.
   3. Channel Material:
      a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
F. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
      b. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
      c. Trapeze Support for Multiple Conduits: 3/8-inch diameter.
      d. Outlet Boxes: 1/4-inch diameter.
G. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
   4. Hollow Masonry: Use toggle bolts.
   5. Hollow Stud Walls: Use toggle bolts.

6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that mounting surfaces are ready to receive support and attachment components.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install hangers and supports in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.
C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
G. Equipment Support and Attachment:
    1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
    2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
    3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
    4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
H. Secure fasteners in accordance with manufacturer's recommended torque settings.
I. Remove temporary supports.

END OF SECTION

SECTION 27-0533.13 - CONDUIT FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel electrical metallic tubing (EMT).
B. Rigid polyvinyl chloride (PVC) conduit.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of cables to be installed.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
B. Sequencing:
   1. Do not begin installation of communications cables until installation of conduit between termination points is complete.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS for submittals procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, TIA-569, BICSI ITSIMM, BICSI TDMM, manufacturers' instructions, and product listing.
B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements.
C. Underground:
   1. Under Slab on Grade: Use rigid PVC conduit.
D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), or galvanized steel electrical metallic tubing (EMT).
E. Concealed Within Hollow Stud Walls: Use galvanized steel electrical metallic tubing (EMT).
F. Concealed Above Accessible Ceilings: Use galvanized steel electrical metallic tubing (EMT).

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70 and TIA-569.
B. Provide conduit, fittings, supports, and accessories required for complete communications pathway.
C. Provide products listed, classified, and labeled as suitable for purpose intended.
D. Maximum Number of Communications Outlet Boxes per Continuous Conduit Homerun: Two.

E. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Communications Outlet Box: 1-inch trade size.
F. Where conduit size is not indicated, size to comply with NFPA 70, TIA-569, and BICSI TDMM, but not less than applicable minimum size requirements specified. Where specified standards differ, comply with most stringent.

2.03 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression/gland or set-screw type.
      a. Do not use indenter type connectors and couplings.
   4. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

2.04 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage.
B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.
   3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
      a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that mounting surfaces are ready to receive conduits.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install conduit in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.
C. Install galvanized steel electrical metallic tubing (EMT) in accordance with NECA 101.
D. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
E. Conduit Routing:
   1. When conduit destination is indicated without specific routing, determine exact routing required.
   2. Conceal conduits unless specifically indicated to be exposed.
   3. Conduits in the following areas may be exposed, unless otherwise indicated:

a. Electrical rooms.
b. Communications rooms.
c. Mechanical equipment rooms.

4. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
5. Arrange conduit to provide no more than equivalent of two 90-degree bend(s) between pull points.
6. Arrange conduit to provide minimum bend radii in accordance with BICSI TDMM.
7. Maintain recommended separation from sources of EMI greater than 5 kVA in accordance with BICSI ITSIMM and BICSI TDMM.
8. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
   a. Heaters.
   b. Hot water piping.

F. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

G. Connections and Terminations:
1. Use suitable adapters where required to transition from one type of conduit to another.
2. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect cables.
3. Secure joints and connections to provide mechanical strength and electrical continuity.

H. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves and/or slots for penetrations as indicated or as required to facilitate installation.
4. Conceal bends for conduit risers emerging above ground.
5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07-8400.

I. Underground Installation:
1. Provide trenching and backfilling; see Section 31-2316.13.
2. Provide underground warning tape along entire conduit length where not concrete-encased.

J. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed cables or connected equipment. This includes, but is not limited to:
    1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
    2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
    3. Where conduits are subject to earth movement by settlement or frost.

K. Conduit Sealing:
    1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
        a. Where conduits enter building from outside.
        b. Where service conduits enter building from underground distribution system.
        c. Where conduits enter building from underground.
        d. Where conduits may transport moisture to contact live parts.
    2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
        a. Where conduits pass from outdoors into conditioned interior spaces.
        b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

L. Provide grounding and bonding.

3.03 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of cables.

END OF SECTION

SECTION 27-1000 - STRUCTURED CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.
B. Communications pathways.
C. Copper cable and terminations.
D. Communications equipment room fittings.
E. Communications outlets.
F. Communications grounding and bonding.
G. Communications identification.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
   3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
C. Evidence of qualifications for installer.
D. Field Test Reports.
E. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
   1. Record actual locations of outlet boxes and distribution frames.
   2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
   3. Identify distribution frames and equipment rooms by room number on drawings.
F. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.
B. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
   1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
   2. Supervisors and installers factory certified by manufacturers of products to be installed.
C. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.06 WARRANTY

A. See Section 01-7800 - CLOSEOUT SUBMITTALS, for additional warranty requirements.
B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
   1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
   2. Comply with Communications Service Provider requirements.
   3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
   4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
   5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
B. System Description:
   1. Building Entrance Cable: By others.
   2. Offices and Work Areas: Provide one voice outlet and one data outlet in each work area.
   3. Provide additional outlets where indicated on drawings.
C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
   1. Locate main distribution frame as indicated on the drawings.
   2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.
D. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.02 PATHWAYS

A. Conduit: See section 27-0533.13.
B. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

2.03 COPPER CABLE AND TERMINATIONS

A. Manufacturers:
   1. CommScope; _____: www.commscope.com/#sle.
   2. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.
B. Copper Horizontal Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
   2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
   3. Cable Capacity: 4-pair.
   4. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.

b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
c. General Purpose Applications: Use listed NFPA 70 Type CM/CMG general purpose cable, Type CMR riser cable, or Type CMP plenum cable.

5. Cable Jacket Color - Voice and Data Cable: Blue.
6. Product(s):
   a. CommScope; SYSTIMAX Twisted Pair Cables; GigaSPEED XL Category 6 U/UTP Cable: www.commscope.com/#sle.
   b. CommScope; Uniprise Twisted Pair Cables; CS34 Series Category 6 U/UTP Cable: www.commscope.com/#sle.
   c. General Cable Technologies Corporation; GenSPEED Cables: www.generalcable.com/#sle.

C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

D. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
1. Performance: 500 mating cycles.
2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
3. Product(s):
   a. CommScope; SYSTIMAX RJ45 Jacks; MGS400 Series Category 6 U/UTP Modular Jacks: www.commscope.com/#sle.
   b. CommScope; Uniprise RJ45 Jacks; UNJ600 Series Category 6 U/UTP Modular Jacks: www.commscope.com/#sle.
   c. _____.

E. Copper Patch Cords:
1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
2. Patch Cords for Patch Panels:
   a. Quantity: One for each pair of patch panel ports.
   b. Length: 3 feet.
3. Patch Cords for Work Areas:
   a. Quantity: One for each work area outlet port.
4. Product(s):
   a. CommScope; SYSTIMAX Category 6 U/UTP Patch Cords: www.commscope.com/#sle.
   b. CommScope; Uniprise Category 6 U/UTP Patch Cords: www.commscope.com/#sle.

2.04 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:
1. Manufacturers:
   a. CommScope; _____: www.commscope.com/#sle.
2. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.

3. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
    a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
    b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
    c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
    d. Provide incoming cable strain relief and routing guides on back of panel.
4. Product(s):
    a. CommScope; SYSTIMAX Copper Panels; 360-IPR-1100-XX Series Patch Panels: www.commscope.com/#sle.
    b. CommScope; Uniprise Copper Panels; UNP-XX-DM Series Patch Panels: www.commscope.com/#sle.

B. Backboards: Interior grade plywood without voids, 3/4 inch thick; UL-labeled fire-retardant.
1. Size: As indicated on drawings.
2. Do not paint over UL label.

C. Equipment Frames, Racks and Cabinets:
1. Manufacturers:
    a. CommScope; _____: www.commscope.com/#sle.
2. Component Racks: EIA/ECA-310 standard 19 inch wide.
3. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.
4. Product(s):
    a. CommScope Two-Post Equipment Racks (Relay Racks) ; www.commscope.com/#sle.

D. Cable Management:
1. Manufacturers:
    a. CommScope; _____: www.commscope.com/#sle.
2. Product(s):
    a. CommScope Horizontal/Vertical Cable Managers; HCM-SS-XX-XX/VCM-DS-XX-XX Series: www.commscope.com/#sle.

2.05 COMMUNICATIONS OUTLETS

A. Manufacturers:
1. CommScope; _____: www.commscope.com/#sle.

B. Outlet Boxes: Comply with Section 26-0533.16.
1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:
    a. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.

C. Wall Plates:
1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Capacity:

a. Data or Combination Voice/Data Outlets: 2 ports.

4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26-2726.

2.06 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607.

B. Comply with Section 26-0526.

2.07 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

B. Comply with Section 26-0553.

2.08 SOURCE QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.

B. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with Communication Service Provider requirements.

C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

3.02 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:

1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
2. 12 inches from power conduits and cables and panelboards.
3. 5 inches from fluorescent and high frequency lighting fixtures.
4. 6 inches from flues, hot water pipes, and steam pipes.

B. Outlet Boxes:

1. Coordinate locations of outlet boxes provided under Section 26-0533.16 as required for installation of telecommunications outlets provided under this section.
   a. Mounting Heights: Unless otherwise indicated, as follows:
      1) Telephone and Data Outlets: 18 inches above finished floor.
   b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   c. Provide minimum of 24 inches horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
   d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
   e. Locate outlet boxes so that wall plate does not span different building finishes.
   f. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.

2. Do not over-cinch or crush cables.
3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
1. At Distribution Frames: 120 inches.
2. At Outlets - Copper: 12 inches.

C. Copper Cabling:
1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
3. Use T568B wiring configuration.

D. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

E. Identification:
1. Use wire and cable markers to identify cables at each end.
2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
1. Inspect cable jackets for certification markings.
2. Inspect cable terminations for color coded labels of proper type.
3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
1. Test operation of shorting bars in connection blocks.
2. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 28-4600 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

1.02 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Evidence of designer qualifications.
C. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
   1. Copy (if any) of list of data required by authority having jurisdiction.
   2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
   4. System zone boundaries and interfaces to fire safety systems.
   5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
   6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
   7. List of all devices on each signaling line circuit, with spare capacity indicated.
   8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
   9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
   10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
   11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
   12. Certification by Contractor that the system design complies with Contract Documents.
D. Evidence of installer qualifications.
E. Evidence of instructor qualifications; training lesson plan outline.
F. Evidence of maintenance contractor qualifications, if different from installer.
G. Inspection and Test Reports:
   1. Submit inspection and test plan prior to closeout demonstration.
   2. Submit documentation of satisfactory inspections and tests.
   3. Submit NFPA 72 "Inspection and Test Form," filled out.
H. Operating and Maintenance Data: See Section 01-7800 fo-radd; have one set available during closeout demonstration:
   1. Complete set of specified design documents, as approved by authority having jurisdiction.
   2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
   3. Contact information for firm that will be providing contract maintenance and trouble call-back service.

4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

I. Project Record Documents: See Section 01-7800 fo-radd:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

J. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.03 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

D. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.04 WARRANTY

A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units and Accessories:
   1. Honeywell Security & Fire Solutions/Gamewell-FCI; _____: www.gamewell-fci.com/#sle.
   2. Honeywell Security & Fire Solutions/Fire-Lite; _____: www.firelite.com/#sle.
   3. Honeywell Security & Fire Solutions/Notifier; _____: www.notifier.com/#sle.
   4. Siemens Building Technologies, Inc; _____: www.usa.siemens.com/#sle.
   5. Simplex, a brand of Johnson Controls; _____: www.simplex-fire.com/#sle.
   6. Provide control units made by the same manufacturer.

B. Initiating Devices and Notification Appliances:
   1. Honeywell Security & Fire Solutions/Gamewell-FCI; _____: www.gamewell-fci.com/#sle.
   2. Honeywell Security & Fire Solutions/Fire-Lite; _____: www.firelite.com/#sle.
   3. Honeywell Security & Fire Solutions/Notifier; _____: www.notifier.com/#sle.
   4. Siemens Building Technologies, Inc; _____: www.sbt.siemens.com/#sle.
   5. Simplex, a brand of Johnson Controls; _____: www.simplex-fire.com/#sle.

C. Substitutions: See Section 01-6000 - PRODUCT REQUIREMENTS.
   1. For other acceptable manufacturers of control units specified, submit product data showing equivalent features and compliance with Contract Documents.
   2. For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with Contract Documents.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
   1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
   2. Protected Premises: Entire building shown on drawings.
   3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
      a. ADA Standards.
      b. The requirements of the State Fire Marshal.
      c. The requirements of the local authority having jurisdiction .
      d. Applicable local codes.
      e. Contract Documents (drawings and specifications).
      f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
   4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
   5. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
   6. Fire Alarm Control Unit: New, located at fire command center.

B. Supervising Stations and Fire Department Connections:
   1. Public Fire Department Notification: By on-premises supervising station.

C. Circuits:

1. Initiating Device Circuits (IDC): Class B, Style A.
2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
3. Notification Appliance Circuits (NAC): Class B, Style W.

D. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
1. Sprinkler water control valves.
2. Dry-pipe sprinkler system pressure.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Sprinkler water flow.
2. Kitchen hood suppression activation; also disconnect fuel source from cooking equipment.

C. HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

2.04 COMPONENTS

A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Master Control Unit: _____.

D. Remote Annunciators: _____.

E. Addressable Modules:
1. Provide addressable modules suitable for connection to fire alarm control unit signaling line circuits.
2. Unless otherwise indicated, use addressable modules only in clean, dry, indoor, nonhazardous locations.
3. Monitor Modules: Unless devices are explicitly permitted to be connected together as zone, provide separate addressable monitor module for each conventional dry-contact input device in order to be individually identifiable by addressable fire alarm control unit.

F. Initiating Devices:
1. Addressable Systems:
a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.

G. Notification Appliances:

H. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.

I. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

J. Locks and Keys: Deliver keys to Owner.

K. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
   1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
   2. Provide one for each control unit where operations are to be performed.
   3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
   4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
   1. Hands-On Instruction: On-site, using operational system.
   2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.

B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
   1. Initial Training: 1 session pre-closeout.

C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
   1. Initial Training: 1 session pre-closeout.

D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.04 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

3.05 MAINTENANCE

A. See Section 01-7000 - EXECUTION AND CLOSEOUT REQUIREMENTS, for additional requirements relating to maintenance service.

B. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
   1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
   2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
   3. Record keeping required by NFPA 72 and authorities having jurisdiction.

C. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 2 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

D. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

E. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

F. Comply with Owner's requirements for access to facility and security.

END OF SECTION

SECTION 31-3116 – TERMITE CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
B. General Coordination Procedures, (Reference Specification Section 01 31 00) General Contractor shall coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work that depend on each other for proper installation, connection, and operation.

1.02 SUMMARY

A. Section Includes: Furnish and install a chemical barrier to afford the structure protection from termites and other common ground insects
   1. Soil treatment for termite control.
B. Related Sections include the following:
   1. Division 01, Section "Temporary Facilities and Controls", for pest control requirements during and at conclusion of construction period.
   2. Division 03, Section "Cast-In-Place Concrete”
   3. Division 06, Section "Rough Carpentry", for wood preservative treatment by pressure process.
   4. Division 07, Section "Vapor Barrier".

1.03 QUALITY ASSURANCE

A. Comply with all applicable regulatory and environmental requirements.
B. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who employs workers trained and approved by manufacturer to install manufacturer's products.
   1. Any chemicals toxic to animals and plant life should be applied with caution by an experienced person who is licensed in accordance with the regulatory agency of the State.
C. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.
D. Preinstallation Conference: Conduct conference at Project site.

1.04 SUBMITTALS

A. Action Submittals: Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components, and profiles for termite control products.
   2. Include the EPA-Registered Label for termiticide products.
B. Informational Submittals:
   1. Qualification Data: For qualified Installer.
   2. Product Certificates: For each type of termite control product.
   3. Sample Warranties.
C. Closeout Submittals: Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and inclusion in O&M Manuals. Include the following:
   1. Date and time of application.
   2. Moisture content of soil before application.
   3. Termiticide brand name and manufacturer.

4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes used, and rates of application.
6. Areas of application.
7. Water source for application.

1.05 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
B. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.06 WARRANTY

A. Soil Treatment Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor, certifying that project has been registered with Manufacturer to meet the required Warranty criteria, provide termite control work for the duration of the Warranty, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites, including Formosan termites (Coptotermes formosanus). If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.
   1. Warranty Period: Five years from date of Substantial Completion.
   2. At the end of the (5) year period, the Owner shall be offered a renewable contract (Guarantee) on a year-to-year basis, at the Owner's option, at an agreed upon annual fee.

1.07 CONTINUING MAINTENANCE SERVICE

A. Continuing Service: Beginning at Substantial Completion, provide five years continuing service including monitoring, inspection, and re-treatment for occurrences of termite activity. Provide a standard continuing service agreement. State services, obligations, conditions, terms for agreement period, and terms for future renewal options.

PART 2 - PRODUCTS

2.01 SOIL TREATMENT

A. Termiticide: Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. BASF Corporation, Agricultural Products; Termidor.
      b. Bayer Environmental Science; Premise.
   2. Pest Control Contractors: Subject to compliance with requirements, acceptable applicators include but are not necessarily limited to:
      a. Terminix
      b. Orkin
      c. Myers
      d. Metrogard
   3. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.
B. Materials shall be used, provided:

1. They are determined to meet five (5) year test conducted by the U.S. Forest Service, or the U.S. Department of Agriculture.
2. Evidence is provided indicating any toxic effects to humans, plants or animal life.
3. Allowed by governing laws and/or ordinances.

PART 3 - EXECUTION

3.01 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.02 APPLYING SOIL TREATMENT

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.
B. Proceed with application only after unsatisfactory conditions have been corrected.
C. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
    1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.
D. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
    1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
    2. Foundations: Adjacent soil, including soil along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
    3. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
E. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.
F. Post warning signs in areas of application.
G. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
H. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 31 31 16

SECTION 31-2200 - GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil.
B. Rough grading the site for site structures.
C. Finish grading.

1.02 RELATED REQUIREMENTS

A. Section 31-2316 - EXCAVATION.
B. Section 31-2323 - FILL: Filling and compaction.
C. Section 32-9000-LANDSCAPING: Finish ground cover.
D. Section 32-9200-TURF AND GRASSES: Finish ground cover.

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: See Section 32-9000.
B. Other Fill Materials: See Section 31-2323.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum.
B. Stake and flag locations of known utilities.
C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
D. Notify utility company to remove and relocate utilities.
E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
G. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.

3.02 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
B. Do not remove topsoil when wet.
C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
D. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
E. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.03 SOIL REMOVAL

A. Stockpile topsoil to be re-used on site; remove remainder from site.

B. Stockpile subsoil to be re-used on site; remove remainder from site.

3.04 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.
B. Remove debris, roots, branches, stones, in excess of 2 inch in size. Remove soil contaminated with petroleum products.
C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
D. Place topsoil to the following compacted thicknesses:
   1. Areas to be Seeded with Grass: 6 inches.
   2. Areas to be Sodded: 4 inches.
   3. Shrub Beds: 18 inches.
E. Place topsoil during dry weather.
F. Remove roots, weeds, rocks, and foreign material while spreading.
G. Near plants spread topsoil manually to prevent damage.
H. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
I. Lightly compact placed topsoil.
J. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.05 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.06 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

3.07 FIELD QUALITY CONTROL

A. See Section 31-2323 for compaction density testing.

3.08 CLEANING

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31-2316 - EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for footings, slabs-on-grade, paving, and utilities within the building.
B. Trenching for utilities outside the building to utility main connections.
C. Temporary excavation support and protection systems.

1.02 RELATED REQUIREMENTS

A. Document Report of Geotechnical Exploration - Fire Station, York Fire Department, dated March 12, 2024, by Schemmer: Geotechnical report; bore hole locations and findings of subsurface materials.
B. Section 31-2200 - GRADING: Soil removal from surface of site.
C. Section 31-2200 - GRADING: Grading.
D. Section 31-2323 - FILL: Fill materials, backfilling, and compacting.

1.03 SUBMITTALS

A. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

1.04 QUALITY ASSURANCE

A. Temporary Support and Excavation Protection Plan:
   1. Indicate sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property.
   2. Bracing and shoring design to meet requirements of OSHA's Excavation Standard, 29 CFR 1926, Subpart P.
B. Designer Qualifications: For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in State Name.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bedding and Fill to Correct Over-Excavation:
   1. See Section 31-2323 for bedding and corrective fill materials at general excavations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.
B. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by Architect. If the proposed excavation extends more than 1 foot into the prevailing groundwater, control groundwater intrusion with a comprehensive dewatering procedures, or as directed by Geotechnical Engineer.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.
B. See Section 31-2200 for topsoil removal.
C. Locate, identify, and protect utilities that remain and protect from damage.
D. Notify utility company to remove and relocate utilities.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.

3.03 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

A. Excavation Safety: Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P.
   1. Depending upon excavation depth, time that excavation is open, soil classification, configuration and slope of excavation sidewalls, design and provide an excavation support and protection system that meets the requirements of 29 CFR 1926, Subpart P:
      a. Sloping and benching systems.
      b. Support systems, shield systems, and other protective systems.

B. Excavation support and protection systems not required to remain in place may be removed subject to approval of Owner or Owner's Representative.
   1. Remove temporary shoring and bracing in a manner to avoid harmful disturbance to underlying soils and damage to buildings, structures, pavements, facilities and utilities.

3.04 EXCAVATING

A. Excavate to accommodate new structures and construction operations.
   1. Excavate to the specified elevations.
   2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
   3. Cut utility trenches wide enough to allow inspection of installed utilities.
   4. Hand trim excavations. Remove loose matter.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.05 SUBGRADE PREPARATION

A. See Section 31-2323 for subgrade preparation at general excavations.

B. See Drawings for overexcavation requirements.

3.06 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

B. See Section 31-2323 for fill, backfill, and compaction requirements at general excavations.

C. See Section 31-2200 for rough and final grading and topsoil replacement requirements.

3.07 REPAIR

A. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31-2323.

3.08 FIELD QUALITY CONTROL

A. Provide for visual inspection of load-bearing excavated surfaces by Architect before placement of foundations.

3.09 CLEANING

A. Remove excavated material that is unsuitable for re-use from site.
B. Remove excess excavated material from site.

3.10 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.
B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 31-2323 - FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, paving, and utilities within the building.
B. Backfilling and compacting for utilities outside the building to utility main connections.
C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Document Report of Geotechnical Exploration - Fire Station, York Fire Department, dated March 12, 2024, by Schemmer: Geotechnical report; bore hole locations and findings of subsurface materials.
B. Section 31-2200 - GRADING: Removal and handling of soil to be re-used.
C. Section 31-2200 - GRADING: Site grading.
D. Section 31-2316 - EXCAVATION: Removal and handling of soil to be re-used.

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
B. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.05 SUBMITTALS

A. See Section 01-3300 SUMBITTAL PROCEDURES, for submittal procedures.
B. Materials Sources: Submit name of imported materials source.
C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
D. Compaction Density Test Reports.
E. Testing Agency Qualification Statement.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.
B. When fill materials need to be stored on site, locate stockpiles on site. Due to space constraints, stockpiles may need to be located off site. Do not place stockpiles over existing utilities to remain.
    1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
    2. Prevent contamination.
    3. Protect stockpiles from erosion and deterioration of materials.

1.08 WARRANTY

A. See Section 01-7700 - CLOSEOUT PROCEDURES, for additional warranty requirements.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Subsoil excavated on-site or local borrow.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

B. Structural Fill: Subsoil excavated on-site or local borrow.
   1. Clean, inorganic, low to medium plasticity lean clay (CL), silt (ML), or combination of these materials with a liquid limit less than 45 and a plasticity index less than 20 complying with ASTM D2487.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

C. Topsoil: See Section 32-9000.

2.02 SOURCE QUALITY CONTROL

A. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

B. If tests indicate materials do not meet specified requirements, change material and retest.

C. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

D. Verify structural ability of unsupported walls to support imposed loads by the fill.

E. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Place fill materials in level lifts, not more than 8 inches loose thickness.

E. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

F. Maintain optimum moisture content of fill materials to attain required compaction density.

G. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

H. Correct areas that are over-excavated using structural fill, flush to required elevation, compacted to densities as specified herein for specific locations.

I. Provide a minimum depth of structural fill of 12 inches below all pavements, exterior pads, and slabs-on-grade.
J. Provide a minimum depth of structural fill of 12 inches below all floor slabs.
K. Scarify and recompact upper 12 inches of subgrade below all sidewalks.
L. Compaction Density Unless Otherwise Specified or Indicated:
    1. Upper 12 inches under floor slabs, pavements, and slabs-on-grade: 98 percent of maximum dry density with water content within -3 and +3 percent of optimum.
    2. Below upper 12 inches of subgrade under floor slabs, pavements, and slabs-on-grade: 95 percent of maximum dry density with water content within -3 and +3 percent of optimum.
    3. Upper 12 inches under sidewalks: 95 percent of maximum dry density with water content within -3 and +3 percent of optimum.
    4. Utility backfill: 95 percent of maximum dry density with water content within -3 and +3 percent of optimum unless location requires greater compaction as specified herein.
    5. Areas to support vegetation only: Between 85 and 92 percent of maximum dry density.
    6. All other areas: 95 percent of maximum dry density with water content within -3 and +3 percent of optimum.
M. Reshape and re-compact fills subjected to vehicular traffic.
N. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.
B. Top Surface of Filling Under Paved Areas and Floor Slabs: Plus or minus 0.5 inch from required elevations.

3.05 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for general requirements for field inspection and testing.
B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D1557 ("modified Proctor"), or ASTM D698 ("standard Proctor").
C. If tests indicate work does not meet specified requirements, remove work, replace and retest.
D. Frequency of Tests:
    1. Structural fill and backfill compaction shall be tested once per lift per every 2,000 square feet or less of area.

3.06 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 32-1313 - CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete integral curbs, gutters, and parking areas.

1.02 RELATED REQUIREMENTS

A. Section 31-2200 - GRADING: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.
B. Section 31-2323 - FILL: Compacted subbase for paving.
C. Section 32-1723 - PAVEMENT MARKINGS.

1.03 SUBMITTALS

A. See Section 01-3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.
B. Product Data: Provide data on joint filler, admixtures, and curing compound.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. Comply with applicable requirements of ACI 301.

2.02 FORM MATERIALS

A. Wood form material, profiled to suit conditions.
B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).

2.03 REINFORCEMENT

2.04 CONCRETE MATERIALS

A. Concrete Materials: Provide in accordance with State of Nebraska DOT Standard Specifications for Highway Construction, 2017 Edition.

2.05 ACCESSORIES

2.06 CONCRETE MIX DESIGN

A. Concrete mix shall conform to 47B-3500 Concrete Mixture per State of Nebraska DOT Standard Specifications for Highway Construction, 2017 Edition.

2.07 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
B. Verify gradients and elevations of base are correct.

3.02 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.
B. Coat surfaces of manhole frames with oil to prevent bond with concrete pavement.

3.03 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.
B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 COLD AND HOT WEATHER CONCRETING

A. Follow recommendations of ACI 305R when concreting during hot weather.
B. Follow recommendations of ACI 306R when concreting during cold weather.
C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.05 PLACING CONCRETE

A. Place concrete in accordance with State of Nebraska DOT Standard Specifications for Highway Construction, 2017 Edition standards.
B. Ensure reinforcement, inserts, embedded parts, formed joints and ____ are not disturbed during concrete placement.
C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.06 JOINTS

A. Contractor is responsible for pavement jointing plan. Submit jointing plan to Architect for review and approval prior to starting the work. Jointing design shall be according to ACI 330. Joint construction shall be per details on the Drawings.
B. Align curb, gutter, and sidewalk joints.

3.07 FINISHING

A. Area Paving: Light broom, texture perpendicular to pavement direction.
B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.
C. Curbs and Gutters: Light broom, texture parallel to pavement direction.
D. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.08 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
B. Maximum Variation From True Position: 1/4 inch.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01-4000 - QUALITY REQUIREMENTS.
    1. Provide free access to concrete operations at project site and cooperate with appointed firm.
    2. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
    1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
    2. Perform one slump test for each set of test cylinders taken.
C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.10 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.

END OF SECTION

SECTION 32-1723 - PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Painted pavement markings.

1.02 RELATED REQUIREMENTS

A. Section 32-1313 - CONCRETE PAVING.

1.03 REFERENCE STANDARDS

A. AASHTO MP 24 - Standard Specification for Waterborne White and Yellow Traffic Paints.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work of this section with adjoining work.

1.05 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used.
B. Installer's qualification statement.
C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. See Section 01-6000 - PRODUCT REQUIREMENTS for additional provisions.
    2. Extra Paint: 2 containers, 1 gallon size, of each type and color.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.08 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 SEQUENCING

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of markings.

PART 2 PRODUCTS

2.01 PAINTED PAVEMENT MARKINGS

A. Painted Pavement Markings: As indicated on drawings.
    1. Marking Paint: In accordance with AASHTO MP 24.
        a. Parking Lots: Yellow.
        b. Symbols and Text: White.
        c. Wheelchair Symbols: Provide blue and white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that pavement is dry and ready for installation.
B. Notify Architect of unsatisfactory conditions before proceeding.

3.02 PREPARATION

A. Place barricades, warning signs, and flags as necessary to alert approaching traffic.
B. Clean surfaces prior to installation.
    1. Remove dust, dirt, and other debris.
    2. Remove rubber deposits, existing paint markings, and other coatings.
C. Apply paint stencils by type and color at necessary intervals.

3.03 INSTALLATION

A. General:
    1. Position pavement markings as indicated on drawings.
    2. Field location adjustments require approval of Architect.
B. Painted Pavement Markings:
    1. Apply in accordance with manufacturer's instructions.
    2. Marking Paint: Apply uniformly, with sharp edges.
        a. Applications: One coat.
        b. Wet Film Thickness: 0.015 inch, minimum.
        c. Stencils: Lay flat against pavement, align with striping, remove after application.

3.04 TOLERANCES

A. Maximum Variation From True Position: 3 inches (76 mm).
B. Maximum Offset From True Alignment: 3 inches (76 mm).

3.05 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS for additional requirements.
B. Perform field inspection for deviations from true alignment or material irregularities.
C. If inspections indicate work does not meet specified requirements, rework and reinspect at no cost to Owner.
D. Allow the pavement marking to set at least the minimum time recommended by manufacturer.

3.06 PROTECTION

A. Prevent approaching traffic from crossing newly applied pavement markings.
B. Replace damaged or removed markings at no additional cost to Owner.

END OF SECTION

SECTION 32-3223 - SEGMENTAL RETAINING WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Segmental retaining walls made of modular concrete units with or without soil reinforcement.
B. Shop drawings.
C. Retaining wall units.
D. Cap units.
E. Soil reinforcement.
F. Drainage filter.
G. Aggregate for leveling pad.
H. Drainage fill.
I. Reinforced backfill.
J. Drainage pipe.

1.02 RELATED REQUIREMENTS

A. Section 31-2200 - GRADING: Rough and finish grading.
B. Section 31-2316 - EXCAVATION.
C. Section 31-2323 - FILL.

1.03 REFERENCE STANDARDS

A. AASHTO M 288 - Standard Specification for Geosynthetic Specification for Highway Applications.
B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
C. ASTM C1262/C1262M - Standard Test Method for Evaluating the Freeze-Thaw Durability of Dry-Cast Segmental Retaining Wall Units and Related Concrete Units.
D. ASTM C1372 - Standard Specification for Dry-Cast Segmental Retaining Wall Units.
E. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
F. ASTM D1241 - Standard Specification for Materials for Soil-Aggregate Subbase, Base, and Surface Courses.
G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
H. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
I. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus.
J. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
K. ASTM D4595 - Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
L. ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile.
M. ASTM D5262 - Standard Test Method for Determining the Unconfined Tension Creep and Creep Rupture Behavior of Planar Geosynthetics Used for Reinforcement Purposes.

N. ASTM D5321/D5321M - Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear.
O. ASTM D5818 - Standard Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics.
P. ASTM D6638 - Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks).
Q. ASTM D7928 - Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis.
R. NCMA TR-127 - Design Manual for Segmental Retaining Walls.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of soil reinforcement with segmental retaining wall size, location, and installation of service utilities.

1.05 SUBMITTALS

A. Segmental Retaining Wall Units:
   1. Manufacturer's product data.
   2. Test data on freeze-thaw durability per ASTM C1372.
   3. Test data on unit strength and shear resistance between units.
   4. Test data on soil reinforcement connection.
   5. Manufacturer's certification that units meet requirements of specification.
   6. Storage and handling requirements and recommendations.
   7. Installation methods.
B. Soil Reinforcement:
   1. Manufacturer's product data.
   2. Manufacturer's certificate that product meets requirements of specification.
   3. Preparation instructions and recommendations.
   4. Storage and handling requirements and recommendations.
   5. Installation methods.
C. Shop Drawings: Engineering drawings for installation, including elevations, large-scale details of elevations, typical sections, details, and connections, soil reinforcement, and drainage provisions.
   1. Include marked up contract drawings showing exact dimensions for blocks, required coping, and other minor revisions.
   2. Design Data: Submit detailed design calculations showing compliance with specified design criteria and material evaluations performed in accordance with specified design standard, signed and sealed by Design Engineer. Engineer shall be registered and licensed in the State of Nebraska.
   3. Submit no less than 2 weeks prior to start of work.
   4. Obtain approval of Architect prior to start of work.
D. Unit Sample for Selection: Minimum 3 inch square pieces of actual units showing colors and finish textures available.
E. Soil Reinforcement to Unit Connector: One connector.
F. Design Engineer's Qualification Statement.
G. Concrete Unit Manufacturer Qualification Statement.
H. Installer Qualification Statement.

1.06 QUALITY ASSURANCE

A. Design Engineer Qualifications: Provide design by or under direct supervision of Professional Engineer experienced in the work of this section and licensed in State of Nebraska and:
   1. Having minimum of five years documented experience in design of reinforced soil structures.
   2. Employed by firm that has designed a minimum of 500,000 square feet of segmental retaining walls.
   3. Having minimum of $2,000,000 aggregate liability insurance.

B. Manufacturer Qualifications -- Concrete Units: Firm specializing in manufacturing products specified in this section and:
   1. With not less than 2 years experience.
   2. Whose products have been used on a minimum of five successfully completed projects similar in scope and size.
   3. Having a minimum of 1,000,000 square feet of successfully completed retaining walls.
   4. Provide certification that concrete units meet the requirements of this specification.

C. Manufacturer Qualifications -- Soil Reinforcement: Firm specializing in manufacturing products specified in this section and:
   1. With not less than 2 years experience.
   2. Whose products have been used on a minimum of five successfully completed projects similar in scope and size.
   3. Having a minimum of 1,000,000 square feet of successfully completed retaining walls.
   4. Provide certification that soil reinforcement meet the requirements of this specification.

D. Installer Qualifications: Firm specializing in design and installation of segmental retaining walls and:
   1. With not less than 2 years documented experience.
   2. With a minimum of five previously constructed successful projects, similar in size and magnitude, using specified retaining wall system; provide contact names and numbers.
   3. Having site supervisor with verifiable qualified experience suitable for this project.
   4. Approved by retaining wall system manufacturer.

E. Preconstruction Soil Testing: Engage a qualified independent testing agency to test soil reinforcement and backfill materials for compliance with design criteria.
   1. Testing Agency Qualifications: As specified in Section 01-4000.

F. Product Testing: Performed by qualified independent testing agency or by manufacturer and witnessed by qualified independent testing agency.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products above ground on wood pallets or blocking, in manufacturer's unopened packaging, until ready for installation.

B. Prevent excessive soil and mud from coming in contact with face of concrete units.

C. Protect material from damage. Do not use damaged material. Remove damaged material from the site.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 FIELD CONDITIONS

A. Existing Conditions: See subsurface investigation report; see Section 00-3100.

1.09 WARRANTY

A. See Section 01-7700 CLOSEOUT PROCEDURES, for additional warranty requirements.

PART 2 PRODUCTS

2.01 RETAINING WALLS

A. Contractor is responsible for design of the retaining walls.

B. Design Standard: Design retaining walls to be capable of withstanding the effects of gravity loads due to soil pressures resulting from grades indicated, determined in accordance with:
   1. NCMA TR-127.
   2. Include effects of sloped backfill as indicated on drawings.
   3. Include effects of superimposed loads (surcharge).
   4. In addition, comply with applicable local, state, and federal codes and regulations.
   5. This design method considers potential failure modes categorized by external, internal, local, compound, and global stability.
   6. Provide engineering services as required for analysis for all modes of stability.
   7. Use of design software for calculations is permitted.
   8. Submit complete shop drawings showing all features of the design.

C. Mass (Weight) Per Wall Face Area: 35 pounds per square foot, minimum, including filled voids.

D. Shear Resistance: Design the wall not to exceed the capacity of materials and soils to resist shear:
   1. Shear Resistance Between Units: Determine in accordance with ASTM D6916.
   2. Connection Between Units and Soil Reinforcement: Determine in accordance with ASTM D6638. Strength shall exceed the maximum tensile force with a Factor of Safety of 1.5.
   3. Coefficient for Direct Shear of Reinforcement on Soil: Determine in accordance with ASTM D5321/D5321M using soil similar in gradation and texture to that to be used for fill in the reinforced zone.

E. Soil Reinforcement:
   1. Test reinforcement to be used in accordance with ASTM D6706 using soil taken from project site.
   2. Do not use more than one type of reinforcement attached to units within the same wall; do not use products made by different manufacturers in the same wall; minimize the number of different reinforcement and filter products to avoid confusion in placement.
   3. Walls Less Than 12 feet High: Use only one type of reinforcement of one grade and strength.
   4. Length Back from Wall: Not less than dimensions shown on drawings.
   5. Long Term Design Strength of Reinforcement: LTDS = Tult / (RFd x RFid x RFcr), where:
      a. Tult = Ultimate (tensile) strength per ASTM D4595.
      b. RFd = Reduction Factor for chemical and biological durability; minimum 2.0 if durability testing has not been conducted, otherwise 1.1 for High-density polyethylene. (HDPE), and 1.1 for polyethylene terephthalate (PET).
      c. RFid = Reduction Factor for Installation Damage; minimum 1.1 and 3.0 if testing per ASTM D5818 has not been conducted.
      d. RFcr = Reduction Factor for Creep; consistent with test procedure used for determining the ultimate strength per ASTM D5262.
      e. The product RFd x RFid x RFcr shall be greater than 2.0.

F. Drainage: Design to prevent water accumulation in retained soil; use drainage fill and drainage pipe per the design engineer's recommendations; provide outlets at 50 foot intervals along length of wall, minimum.

G. Minimum Factor of Safety: Design with the following stability requirements:
   1. Sliding = 1.5.
   2. Pullout = 1.5.
   3. Tensile Overstress = 1.5.
   4. Overturning = 2.0.
   5. Bearing Capacity = 2.0.

2.02 MATERIALS

A. Retaining Wall Units: Machine-formed concrete blocks of shapes and sizes suitable for the retaining wall configuration required and complying with ASTM C1372 and the following:
   1. Face Color: To be selected by Architect from manufacturer's standard color palatte.
   2. Texture: Split face, on exposed surfaces.
   3. Face Shape: Straight (flat).
   4. Length (Face Width): 8 inches, minimum.
   5. Width (Depth from Face): 11 inches, minimum, not including textured finish.
   6. Moisture Absorption: 8 percent, maximum.
   7. Freeze-Thaw Resistance: Maximum of 1 percent or less weight loss after 100 cycles for each of 5 specimens or maximum of 1.5 percent or less weight loss after 150 cycles for 4 of 5 specimens, when tested in accordance with ASTM C1262/C1262M.

B. Cap Units: Portland cement concrete machine-formed solid blocks, matching segmental retaining wall units, complying with ASTM C1372, with abutting edges saw cut or formed to provide tight fitting, flush end-to-end joints.
   1. Depth: To fully cover wall units.
   2. Masonry Adhesive: To secure cap units as top course of wall.
      a. Expected Life Span: 30 years.
      b. Provide adhesive complying with ASTM C920, Type S, Grade NS, Class 25, and as approved by unit manufacturer.

C. Soil Reinforcement: Polymeric geosynthetic specifically fabricated to interlock with surrounding soil, rock, or earth for use as reinforcement, dimensionally stable and able to retain geometry under manufacture, transport, and installation.
   1. Polymeric Material: 100 percent virgin resin with maximum of 5 percent in-plant regrind material; polypropylene, polyethylene, or polyester.
      a. Polyethylene and Polypropylene: Stabilized with long term antioxidants.
      b. Polyester: Minimum molecular weight of 25,000 and carboxyl end group number less than 30.
   2. Permittivity: 0.5 per second, minimum, when tested in accordance with ASTM D4491/D4491M.
   3. UV Resistance: 70 percent after 500 hours, when tested in accordance with ASTM D4355/D4355M.
   4. Durability: Comply with minimum requirements of AASHTO M 288 Class 1; minimum mass of 8 ounces per square yard.

D. Drainage Filter: Geosynthetic textile.

1. Apparent Opening Size: 70 to 100 U.S. Sieve size, when tested in accordance with ASTM D4751.
2. Permittivity: 0.5 per second, minimum, when tested in accordance with ASTM D4491/D4491M.
3. Durability: Comply with minimum requirements of AASHTO M 288 Class 1; minimum mass of 8 ounces per square yard.

E. Aggregate for Leveling Pad: Compacted sand, gravel, or crushed rock complying with one of the following:
1. Meeting requirements of ASTM D1241, Gradation C.
2. Do not use pea gravel.

F. Drainage Fill: Clean, freely draining aggregate placed within, between, or immediately behind segmental retaining wall units; do not use pea gravel; use one of the following:
1. Aggregate as approved by Geotechnical Engineer.
2. Aggregate meeting requirements of ASTM D448, Size No. 57.
3. Crushed stone or coarse gravel, 3/8 inch; no more than 5 percent passing No. 200 sieve.
4. Crushed stone or coarse gravel, meeting requirements of ASTM D7928.

G. Reinforced Backfill: Compacted soil placed behind drainage fill within reinforced soil mass; do not use heavy clay or organic soils; comply with one of the following:
1. Use site-excavated or other soil approved by Geotechnical Engineer.
2. Granular soil with less than 35 percent passing No. 200 sieve per ASTM D7928.
3. Inorganic ASTM D2487 soil types GP, GW, SP, or SM, free of debris.
   a. Maximum Size: 3/4 inch, unless approved by Design Engineer, and design strength reduced to account for additional installation damage.
   b. Plasticity of Fines: Less than 10. Liquid Limit: Less than 40, when tested in accordance with ASTM D4318.

H. Drainage Pipe: 4 inch Perforated schedule 40 PVC, complying with ASTM D3034; or corrugated HDPE complying with ASTM F405; with geotextile filter wrap.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify location of existing structures and utilities prior to excavation.
B. Protect adjacent structures from the effects of excavation.
C. Verify that layout dimensions are correct and substrate is in proper condition for installation.
D. Notify Architect of unsatisfactory conditions.
E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Sitework:
B. Excavation:
1. Excavate to lines and grades indicated on drawings.
2. Do not disturb embankment or foundation beyond lines. Minimize over-excavation; fill over-excavated areas with compacted reinforced backfill or leveling pad material at Contractor's expense.
3. After excavation, and prior to placement of leveling materials, Geotechnical Engineer will examine bearing soil surface to verify strength meets or exceeds design requirements and assumptions.

4. Replace unsuitable bearing soil as directed by Architect.

C. Leveling Pad:
   1. Width: 6 inches minimum extension beyond front and back faces of units.
   2. In lieu of pad made solely of aggregate or concrete, pad may be 3 inches, minimum, of thick compacted sand or crushed rock, covered with 2 inches to 3 inches of unreinforced concrete.
   3. Location: Top of pad at 1 inch below grade for each 8 inches that wall extends above grade.
   4. Compact aggregate to lines and grades on drawings, in lifts 6 inches thick, maximum.
   5. Use only hand-operated compaction equipment within 36 inches of back of wall.

D. Verify level grade before proceeding.

E. Install drainage collection pipe with a continuous fall in the direction of flow. Cap open ends as necessary to prevent soil and debris from entering.

3.03 INSTALLATION

A. Install in accordance with drawings, manufacturer instructions, and applicable codes and regulations.

B. Segmental Retaining Wall Units:
   1. Place first course of units on leveling pad; check alignment and level. Check for full contact with base and for stability.
   2. Place units side by side for full length of wall, aligning back face of straight walls using string line or offset from base line and back face of curved walls using flexible pipe or other method recommended by manufacturer.
   3. Do not leave gaps between units.
   4. Lay out corners and curves in accordance with manufacturer's instructions. Do not leave gaps to produce wall batter or curvature.
   5. Cut blocks with saw; do not split units.
   6. Sweep excess material from tops of units before laying succeeding courses.
   7. Place a maximum of 2 succeeding courses above level backfill. Check for proper alignment and batter.
   8. Where top of wall changes elevation, step units to match grade or turn top course into embankment.
   9. Where bottom of wall changes elevation, step base leveling pad and extend lowest course a minimum of two units into slope.
   10. Install shear connectors per manufacturer recommendations.

C. Soil Reinforcement: Install each layer on fully compacted fill.
   1. Orient soil reinforcement material with highest strength axis perpendicular to wall alignment.
   2. Attach to top of wall units and extend horizontally, full length, over compacted backfill slightly sloping downward away from wall.
   3. Install in one piece lengths with 100 percent coverage in each layer at each level. Do not splice or leave gaps between panels or ends of pieces.
   4. Pull taut and remove slack prior to backfill placement.

D. Drainage Fill: Place drainage fill in, between, and behind units.
   1. Compact to lines and grades on drawings, in lifts 6 inches thick, maximum; decrease lift thickness where necessary to achieve required density.

2. Extend drainage fill 6 inches beyond back face of units.
3. Base of drainage fill elevation shall not exceed two courses or 16 inches from base of wall units.

E. Backfill: Place, spread, and compact backfill from behind drainage fill to undisturbed soil while minimizing the development of slack in the soil reinforcement.
1. Use only lightweight hand-operated compaction equipment within 3 feet from back wall face, or one half of wall height, whichever is greater.
2. Place backfill in lifts of maximum 6 inches to 8 inches loose thickness where hand compaction is used and 8 inches to 10 inches where heavy compaction equipment is used.
3. Compact backfill to 95 percent maximum density and upper 2 feet of backfill to 98 percent maximum density, standard Proctor, as determined in accordance with ASTM D698, or as recommended by Geotechnical Engineer.
4. Moisture content of backfill prior to and during compaction to be within plus or minus 2 percentage points dry of optimum and uniform throughout each layer.
5. Do not operate tracked construction equipment directly upon soil reinforcement. Maintain a minimum fill thickness of 6 inches for operation of tracked vehicles over soil reinforcement. Minimize turning of tracked vehicles while over soil reinforcement.
6. Operate wheeled equipment at speeds less than 10 miles per hour over soil reinforcement.
7. Prevent contamination of the filter fabric, unit fill, blanket drains, chimney drains, and/or drainage composite from poor drainage materials such as fine grained silt and clay.

F. Cap Units: Install and top two courses of units with masonry adhesive.
1. Verify in-place top of wall elevation prior to installation of cap units and adjust accordingly.
2. Clear cap units and top course of segmental retaining wall units of debris and standing water before applying adhesive.
3. Apply masonry adhesive to top surface of top unit and place cap into position over projecting pins. Protect wall face from masonry adhesive.

G. Site Drainage:
1. At end of each day:
a. Grade backfill a minimum of 2 percent away from wall to prevent runoff from adjacent areas from entering wall site and to prevent ponding at the wall.
b. Construct a berm at the crest of the wall to prevent surface water from overtopping.
2. At completion, if other work adjacent to wall is not to be done immediately (paving, landscaping, etc), grade top of backfill and provide temporary drainage to prevent water runoff toward the wall.

3.04 TOLERANCES

A. Top of Wall:
1. Plan Location: Maximum of plus/minus 1 inch from plan location.
2. Elevation: Maximum of plus/minus 1-1/2 inch from elevations shown on drawings.

B. Face of Wall Flatness: Measured as deviation from a straight edge.
1. In the Vertical Dimension: Plus/minus 1-1/4 inch per 10 foot section.
2. In the Horizontal Dimension of Straight Walls: Plus/minus 1-1/2 inch per 10 foot section.

C. Overall Wall Batter: Within 2 degrees of design, measured from the vertical.

D. Gap Between Adjacent Units: 1/8 inch, maximum.

3.05 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Provide manufacturer's field representative to observe and inspect concrete units.
C. Observe and inspect:
    1. Concrete units: For correct type, for quality installation with courses that are level and follow the designed batter ratio.
    2. Soil backfill: For correct type, for specified compaction with level grading prior to reinforcement installation.
    3. Soil reinforcement: For correct type, for solid connection to concrete units, and for smooth and taut installation.
    4. Field location in plan and elevation.
D. Soil Tests: For every new soil type and/or for every 2,000 cubic yard per running foot perform Atterberg Limit, Sieve Analysis, and Proctor Compaction tests. Perform additional testing per project Geotechnical Engineer.
E. Owner will engage inspection and testing services, including independent laboratories, to provide quality assurance and testing services during construction. Contractor will secure necessary construction control testing during construction.
F. Correct work found deficient and not in accordance with drawings and specifications.

3.06 CLEANING

A. Clean wall face to remove debris and stains.
B. Leave adjacent paved areas broom clean.

3.07 PROTECTION

A. Prevent damage to wall and earthwork by subsequent construction and uncontrolled runoff until substantial completion; repair damage due to failure to protect wall or earthwork.
B. Do not operate equipment with wheel loads in excess of 150 pounds per square foot live load within 10 feet from the wall face.
C. Do not place temporary soil or fill stockpiles adjacent to wall.

END OF SECTION

SECTION 32-8400 – PLANTING IRRIGATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Furnish all labor, material, equipment and services necessary to provide all landscape planting, complete in place, as shown and specified.
   1. Installation of permanent automatic irrigation system.
   2. Installation and removal of temporary irrigation system where required for establishment of plantings and turf.

B. Related Work Specified in other Sections:
   1. **[Division 12 Section - Site Furnishings for coordination with planter**s.]
   2. Division 22 Section - Plumbing.
   3. Division 26 Section - Electrical for power for controller(s).
   4. **[Division 28 for data connection to remotely monitored controller(s).]**
   5. Division 32 Section - Paving for coordination of irrigation sleeves.
   6. Division 32 Section - Unit Pavers for coordination of irrigation sleeves.
   7. Division 32 Section - Landscaping.
   8. Division 32 Section - Turf and Grasses.
   9. Division 33 Section - Utilities for requirements for irrigation taps.

1.03 SUBMITTALS

A. Product Data: For all materials and components of irrigation system.

B. Shop drawings for irrigation system layout and details.
   1. Designed by qualified irrigation engineer, registered as required for the project location, and according to design criteria specified. Submit to Architect for approval prior to submitting for regulatory approval or permitting.
   2. Where sleeves under new paving are part of the scope of work, irrigation shop drawings shall be submitted in time for Architect's review, prior to start of paving work.

1.04 CLOSEOUT SUBMITTALS

A. Record and As-built Drawings:
   1. The Contractor shall provide and keep up to date and complete "as-built" record set of prints which shall be corrected daily and show changes from original drawings and specifications. Record exact "as-built" locations, sizes, and kinds of equipment continuously updated as irrigation system as installed. This set of drawings shall be kept on-site and be used only as a record set.
   2. These drawings shall be available at all times for inspection.
   3. The Contractor shall make neat and legible notations on as-built sheets as the work proceeds, showing work as actually installed.
   4. Before final completion, Contractor shall transfer all information from "as-built" prints to a copy of the approved shop drawing submittal. Contractor shall use symbols and notation consistent with original shop drawings.
      a. Where as-built copy is neatly recorded and in maintained excellent physical condition, Architect, at his discretion, may allow the as-built copy to become the record set.

5. The Contractor shall dimension from two (2) permanent points of reference (building corners, sidewalk, or road intersections, etc.), the location of the following items:
    a. Connection to existing water lines.
    b. Connection to existing electrical power.
    c. Gate valves.
    d. Routing of sprinkler pressure lines (locate start and end points and with dimensions at maximum intervals of 100' along routing).
    e. Irrigation control valves.
    f. Routing of control wiring.
    g. Quick coupling valves.
    h. All other boxes, and other related equipment as directed by Architect.

B. Operation and Maintenance data.
    1. Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local Manufacturer representatives.
    2. Catalog and parts sheets on every material and equipment installed under this contract.
    3. Complete operating and maintenance instructions on all major equipment.
    4. Guarantee statement.

C. Controller Schedules: (2) copies of laminated controller schedules, size as appropriate to controller and number of zones. Charts to state zone number with brief description of the zone / location, and indicating installer's recommended watering durations and frequency per week for each zone for after landscape plantings are established. (Example: Zone 1: South lawn - 20 min. - twice per week) Post one copy at controller and include second backup copy with O&M's.

D. Controller Zone Maps: (2) copies of laminated 8-1/2"x11" or 11"x17" zone maps (size as appropriate to scale of irrigated site area) showing site plan and graphically locating each zone and the location of the valve controlling each zone. One copy to be posted at irrigation controller and second copy provided to Owner with O&M's as backup copy. Zone maps shall either be color coded or with boxes neatly drawn around the heads of each zone, and clearly numbered to correspond to each zone matching the zones on the irrigation controller.

1.05 DELEGATED DESIGN

A. Engage a licensed irrigation engineer to design and permit a complete irrigation system in compliance with these specifications, and in compliance with requirements of authorities having jurisdiction.
    1. Make adjustments in field as necessary to avoid plantings and other obstructions.

B. Coordination: Prepare design and coordinate installation of required sleeves with other trades as required, prior to paving work. Where existing paving to remain is in the path of irrigation lines, include boring as required to install new irrigation system, unless otherwise noted in Drawings.

C. Design Criteria, General: Contractor shall design an automatic irrigation system to provide adequate irrigation to sustain planting shown in the Landscaping plans, including landscape beds and trees.
    1. Delegated design engineer is responsible to determine existing water pressure and design system to work with available pressure, and to design and performance requirements Indicate design pressure and static pressure on irrigation plans
    2. System for landscape beds shall be comprised entirely of drip and bubbler irrigation. No spray heads allowed.
    3. All new trees shall receive bubbler irrigation, whether or not included in the outline of the zone to be irrigated as shown in the Landscape Drawings.

D. System Design requirements:
    1. Strictly adhere to all authority having jurisdiction rules and regulations.
    2. Velocities shall not exceed 5 F.P.S. Irrigation plan to show velocities for all piping.
    3. System shall be capable of applying .33 inches of water during one watering cycle, between 11:00 pm - 6:00 am. All zones must operate during one watering cycle.

4. All valves shall be in plastic valve boxes no smaller than 10" for single control valves, or nominal 12" x 17" for other valves. Box shall be adequately sized to provide service access for all valves in all cases.
5. Lateral lines to have minimum 12 inch coverage. Main lines to have minimum 18 inch coverage.
6. Provide flex pipe (12 inch minimum length) with barbed fittings for all pop up spray heads.
7. Provide three ell swing joints for all turf type rotor heads.
8. Indicate design pressure and static pressure on plans.
9. Install heads minimum 4 inches from any hard surface.
10. Provide tree irrigation, drip irrigation for planters, landscaping areas drip irrigation, shrub heads and landscape bed spray irrigation, and turf area spray irrigation, on separate zones from each other.
11. All utilities under hard (paved) surfaces shall be sleeved.
12. Sleeves shall be large enough for wire and pipe as required and extend 6 inches beyond hard surface.
13. Irrigation design must account for minimum drift and reduction of water on street and paved surfaces.
14. Where possible, micro irrigation may be utilized.
15. System to provide complete coverage at all landscape bed areas.
16. System to provide quick couplers at maximum of 100' intervals.
17. System to be designed with expansion capability to accommodate future expansion zones for future construction of (3) replacement out-buildings and associated landscaping, and as indicated in the Drawings. Provide total of twelve spare wires, evenly divided among the end points designated in the Drawings. Extend minimum size of 1-1/2" main line with capped end to each of these locations. Provide a 10" box at each future expansion termination point.
18. Thrust blocks and concrete valve boxes may be required by Authorities having jurisdiction. Contractor shall coordinate.
19. System design must be approved by Architect prior to permitting, and by Authorities having jurisdiction before installation.
20. Provide system design and layout of heads and emitters by Irrigation Engineer licensed in the State of Texas. Make adjustments in field as necessary to avoid plantings and other obstructions.

E. Temporary Irrigation: If temporary irrigation is utilized to establish grass or landscaping, it must meet the following guidelines:
1. Landscape beds and ground cover areas to be zoned separately from tree irrigation and turf irrigation.
2. Heads in lawn areas shall be offset 4 inches from back of curb and have flat trajectory.
3. Heads in bed areas are to be 2" from hard surface, and be pop-up type.
4. Compliant with any other requirements of local authorities to minimize water on paving surfaces.

1.06 QUALITY ASSURANCE

A. Installer and Designer Qualifications: Licensed and approved as required by local authorities having jurisdiction. Installer with minimum 5 years continuous operation installing irrigation systems of comparable scale and complexity, under the current company and name.

B. Ordinances, Codes and Regulations: All local, municipal and state laws, rules and regulations governing any portion of this work are hereby incorporated into and made a part of these specifications. Their provisions shall be carried out by the Contractor. Requirements of these specifications shall not be construed to conflict with any of these rules, regulations, or requirements of the same.
1. When these specifications and drawings require materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, these specifications and drawings shall take precedence

C. Permits and Fees: The Contractor shall obtain and pay for any and all permits and all observations as required by authorities having jurisdiction.
D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
E. Manufacturer's Directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of articles used in this contract furnish directions covering points not shown in the drawings and specifications.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handling of PVC Pipe and Fittings: The Contractor is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe and fittings. Pipe that has been damaged will be discarded. Installed pipe found to be damaged shall be replaced with new piping. Store plastic piping protected from direct sunlight.

1.08 SUBSTITUTIONS

A. Substitutions for equipment or materials other than those listed on the drawings or specifications, must include the following information for review:
   1. Provide a statement indicating the reason for making the substitution. Use a separate sheet of paper for each item to be substituted.
   2. Provide descriptive catalog literature, performance charts and flow charts for each item to be substituted.
   3. Provide the amount of cost savings if the substituted item is approved.
B. Architect shall have sole authority in accepting or rejecting substituted items as approved equal.

1.09 GUARANTEE

A. Provide Guarantee for the irrigation system in accordance with the attached form. The Standard Form of Agreement and General Conditions of these specifications shall be filed with Owner or his representative, prior to acceptance of the irrigation system.
B. A copy of the Guarantee form shall be included in the operations and maintenance manual.
C. The Guarantee form shall include the Contractor's letterhead, and contain the following information:

GUARANTEE FOR AUTOMATIC IRRIGATION SYSTEM

We hereby Guarantee that the automatic irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications. We agree to repair or replace any defects in material or workmanship which may develop during the period of One Year from date of acceptance, and also to repair or replace damage resulting from such warranty work at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice from the Owner. If we are unable to make such repairs and/or replacements within the given time frame, we authorize the Owner to proceed with repairs / replacements, to be made at our expense. We shall pay the costs and charges upon demand.

PROJECT:_____
LOCATION:_____
SIGNED:_____
ADDRESS:_____
PHONE:_____
DATE OF ACCEPTANCE:_____

1.10 EXTRA MATERIALS

A. Supply as a part of this contract the following tools:

1. Quick coupling keys with swivel hose connections.
2. Two (2) keys for each automatic controller.

B. Extra materials shall be turned over to Owner at conclusion of the project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide materials as specified herein, or approved equal. All heads and valves shall be by the same Manufacturer. The following Manufacturers are acceptable for irrigation heads and valves:
1. Hunter
2. Toro
3. Rain Bird

2.02 MATERIALS

A. Water Meter:
1. Up to 2 inches: As required to operate system, and as approved by authorities having jurisdiction.
2. Greater than 2 inches: Provide (two) 2-inch meters in tandem.

B. Anti-Siphon Device:
1. Double Check Assembly

C. Y-Strainer Devices:
1. Y-strainer to be installed with isolation valve, as required by TCEQ. Installation per TCEQ requirements.

D. Piping and Fittings:
1. PVC Piping:
   a. Pressure main line piping 2" and larger shall be Schedule 40 with solvent welded joints.
   b. Pipe shall be made from an NSF approved Type I, Grade II, PVC compound conforming to ASTM resin specification D2672. All pipe must meet requirements as set forth in Federal Specification PS-22-70, with an appropriate standard dimension (S.D.R.) (Solvent-weld Pipe).
2. PVC Non-Pressure Lateral Line Piping:
   a. Non-pressure buried lateral line piping shall be PVC class 200 with solvent-weld joints.
   b. Pipe shall be made from NSF approved, Type I, Grade II PVC compound conforming to ASTM resin specification D2672. All pipe must meet requirements set forth in Federal Specification PS-22-70 with an appropriate standard dimension ratio.
3. All solvent weld PVC fittings shall be standard weight Schedule 40 (and Schedule 80 where specified on the irrigation detail sheet, all mainline fittings shall be Schedule 80 PVC) and shall be injection molded of an improved virgin PVC fitting compound. Slip PVC fittings shall be the "deep socket" bracketed type. Threaded plastic fittings shall be injection molded. All tees and ells shall be side gated. All fittings shall conform to ASTM D2464 and ASTM D2466.
4. All solvent cementing of plastic pipe and fittings shall be a two-step process, using primer and solvent cement applied per the manufacturer's recommendations. Cement shall be of a fluid consistency, not gel-like or ropy. Solvent cementing shall be in conformance with ASTM D2564 and ASTM D2855.
5. All PVC pipe must bear the following markings:
   a. Manufacturer's name.
   b. Nominal pipe size.
   c. Schedule or class.
   d. Pressure rating in P.S.I.
   e. NSF (National Sanitation Foundation) approval.

f. Date of expiration.

6. When connection is plastic to metal, female adapters shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be non-lead base Teflon paste, tape, or equal.
7. All pressure mainlines installed with solvent weld PVC fittings shall be installed with concrete thrust blocking at all directional changes in the mainline routing. Concrete thrust blocking shall not be required when ductile iron fittings and mechanical restraints are specified.
8. All fittings shall bear the manufacturer's name or trademark, material designation, applicable I.P.S., schedule number and NSF seal of approval.

E. Brass and Copper Pipe and Fittings:
1. Where indicated on the drawings, brass pipe shall be 85 percent red brass, ANSI, IPS Standard 125 pounds, Schedule 40 screwed pipe.
2. Fittings shall be medium brass, screwed 125-pound class.
3. Copper pipe and fittings shall be Type "K" sweat soldered, or brazed as indicated on the irrigation drawings.

F. Sleeves:
1. Sleeves shall be schedule 40. Provide twice the diameter of pipe it is serving.
2. Minimum size sleeve for pipe or wire is 2 inch.
3. Provide spare sleeve at each sleeve location for future use.
4. Each pipe and wire bundle shall have separate sleeves.

G. Heads: Designed for uniform coverage over entire spray area indicated at available water pressure.
1. Plastic, Pop-up, Gear-Drive Rotary Sprinklers:
a. Body Material: ABS.
b. Nozzle: ABS
c. Retraction Spring: Stainless steel.
d. Internal Parts: Corrosion resistant.
e. Pop-up Height: Minimum 6-inch nominal.
f. Adjustable arc and flow.
2. Spray Shrub Heads:
a. Body Material: ABS, or other plastic.
b. Nozzle: ABS.
c. Adjustable flow.
3. Pop-up Spray Heads:
a. Body Material: ABS.
b. Nozzle: ABS.
c. Internal Parts: Corrosion resistant.
d. Minimum nominal pop-up height: 6-inch.
e. Adjustable flow.

H. Quick Couplers: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.

I. Control Valves:
1. Description: Cast-bronze body, normally closed, diaphragm type with manual-flow adjustment.
2. All valves shall include a PVC ball valve for isolation. Provide gravel at 4” depth with 1” air gap between gravel and valve.
3. Install pressure regulating valves for drip system as required. Increase size of valve box as required for access or install PRV's in separate box from control valves.

J. Wiring: UL 493, Type UF multiconductor, with solid-copper conductors; insulated cable; suitable for direct burial.
1. Feeder-Circuit Cables: No. 12 AWG minimum, between building and controllers.

2. Low-Voltage, Branch-Circuit Cables: No. 14 AWG minimum, between controllers and automatic control valves; color-coded different from feeder-circuit-cable jacket color; with jackets of different colors for multiple-cable installation in same trench.
3. All splices shall be in valve boxes with grease wire nuts.
4. Common wire shall be coded white. All other wires to be coded separately.
5. Wire shall be laid loosely in trench without stretching or stress on wiring. Wiring bundled and taped every 10' at the side of pipe in the trench.
6. Minimize field splices to extent possible. Where unavoidable, install field splices inside 6" (minimum size) valve box.
7. Provide controller with at least 6 spare zones.

K. Miscellaneous Piping Specialties:
1. Water Hammer Arresters: ASSE 1010 or PDI WH 201, with bellows or piston-type pressurized cushioning chamber and in sizes complying with PDI WH 201.
2. Pressure Gages: ASME B40.1. Include dial gage, with dial range of two times system operating pressure, and bottom outlet.

L. Plastic Boxes: Box and cover, with open bottom and openings for piping; designed for installing flush with grade.
1. Valve boxes shall be fabricated from a durable, weather-resistant plastic material resistant to sunlight and chemical action of soils.
2. Shape and size: As required for valves and service, and minimum sizes as follows:
a. Drip flush valve and Air relief valve: 6" circular.
b. Quick coupler valve boxes: 10" circular.
3. The cover and box shall be capable of sustaining a load of 1,500 pounds.
4. Valve box extensions shall be by the same manufacturer as the valve box.
5. The plastic irrigation valve box cover shall be an overlapping type.

2.03 DRIP IRRIGATION SPECIALTIES

A. General:
1. All bubblers shall be of the same size, type, and deliver the same pressure, and discharge as shown on the approved shop drawings and/or specified in these special provisions.
2. All bubblers of the same type shall be products of the same Manufacturer.

B. Drip Tubing and Emitter System:
1. Provide pressure regulating valves after zone valves as required to regulate pressure in polyethylene tubing within manufacturer's recommended pressure range and for design flow rate.
2. Tubing shall be brown in color.
3. System should include emitters of various types as recommended by irrigation engineer for optimal performance and approved by Architect in approved shop drawings.
4. Drip tubing shall be low-density linear polyethylene tubing with pressure compensating, continuously self-cleaning, integral drippers with internal check valves at a specified spacing.
5. Individual pressure compensating drippers shall be welded to the inside wall of the tubing as an integral part of the tubing assembly and shall have a built-in physical root barrier whereby the water shall exit the dripper from one location and shall exit the tubing from a second location.
6. Drip tubing shall be the size and type specified on the approved shop drawings.
7. Air/vacuum relief valves and flush valves shall be by the same manufacturer as the drip tubing.
a. Air Relief Valves: Brass or plastic housing, with corrosion-resistant internal parts.
b. Vacuum Relief Valves: Brass or plastic housing, with corrosion-resistant internal parts.

C. Off-Ground Supports: Plastic stakes.

D. Application Pressure Regulators: Brass or plastic housing, NPS 3/4, with corrosion-resistant internal parts; capable of controlling outlet pressure to approximately 20 psig.

E. Filter Units: Brass or plastic housing, with corrosion-resistant internal parts; of size and capacity required for devices downstream from unit.

2.04 AUTOMATIC CONTROL SYSTEM:

A. General: Furnish low voltage system manufactured suited for control of automatic circuit valves for underground sprinkler systems. Provide capacity to suit number of circuits as required for system as described.
B. Transformer: Provide as required to reduce building service voltage to control voltage of 24 volts.
C. Circuit Control: Each circuit variable from approximately 5 to 60 minutes. Include switch for manual or automatic operation of each circuit.
D. Controller: Adjustable, 24-hour, (7 or 14 day) clocks, capable to run a program once or two or more times during a day, and to run or skip operation for any day in either a 7 or 14 day recurring period. Controller to allow to program and store a minimum of two recurring programs. Each zone individually programmable for each watering program, from 1 to 60 minutes, by 1 minute increments. Allow for manual or semi-automatic operation without disturbing preset automatic operation.
    1. Controller capable of being remotely monitored and programmed / controlled through data connection.
    2. Model: Any model meeting specified requirements.
    3. Exterior Control Enclosure: NEMA 250, Type 4, weatherproof, with locking cover and two matching keys; include provision for grounding.
        a. Body Material: Enameled-steel sheet metal.
        b. Mounting: Surface type for mounting to wall.
            1) Concrete Base: Reinforced precast concrete base not less than 6 inches greater in each direction than overall dimensions of controller. Include opening for wiring.
    4. Interior Control Enclosures: NEMA 250, Type 12, drip-proof, with locking cover and two matching keys.
        a. Body Material: Enameled-steel sheet metal.
        b. Mounting: Surface type for mounting on wall.
E. Provide rain/freeze and moisture sensors. Locate at back side of parapet and with wiring penetrations and attachment of sensor per roofing contractor's requirements, or in another location acceptable to Architect and where protected from vandalism.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Site Conditions:
    1. All scaled dimensions are approximate. The Contractor shall verify all site dimensions.
    2. Exercise care in excavating and working near existing utilities. Contractor shall be responsible for damage to utilities caused by his operations. Review drawings for existing utility locations, and when required, have utilities located when not shown.
    3. Irrigation system shall not interfere with now or existing utilities, or other construction. System shall not cause difficulty in planting trees, shrubs, and ground covers. Coordinate work of all sub-contractors.
    4. Verify all grades for conflicts before starting work on the irrigation system.
B. Notify Architect in writing of conditions detrimental to timely completion of work.
C. Do not proceed until conditions are satisfactory.

3.02 COORDINATION AND PREPARATION

A. Coordinate work embedded in concrete or masonry, or routed under paved areas. Provide sleeves as required.
B. Locate and mark all existing utilities that may conflict with trenching.

C. Set stakes to identify location of irrigation system heads.
D. Provide timely delivery and installation at job site.

3.03 INSTALLATION

A. General:
   1. Excavation: Excavate earth, rock or any combination thereof, in wet or dry state.
   2. Backfill: Use excavated material except where pipe manufacturer's specifications require otherwise. Use select fill dirt or sand if existing soil is rocky or contains large clods. Hand-tamp and water-jet to prevent settling. Hand rake trenches and adjoining areas to leave grade in as good or better condition prior to beginning installation.
   3. Pipe Layout: Route around trees and shrubs to avoid damage to root system. Do not dig within root balls of newly planted trees or shrubs. Do not move or damage trees and shrubs.

B. Pipe Installation:
   1. Sprinkler Main Lines: Provide 4" wide (minimum) trench, minimum 18" depth. Record locations on record drawings.
   2. Lateral Piping: Provide 4" wide (minimum) trench, minimum 12" depth.
   3. Trenching: Remove all foreign material and earth greater than 1-1/2" in diameter from trenches. Provide firm, uniform bearing for entire length of pipe to prevent uneven settlement. Pad trenches with dirt or sand where rocky. Do not wedge or block pipe. Lay pipe from side to side of trench bottom to allow for expansion and contraction. Remove foreign matter or dirt from pipe interior prior to welding. Keep clean during / after installation.
      a. No machine trenching is to be done within drip line of trees. Trenching around existing trees shall be done by hand, by tunneling or boring, or by other methods as approved by Architect. Piping layout is diagrammatic, and shall be routed around existing trees to avoid root damage.
   4. Install dielectric fittings for dissimilar-metal pipe connections.

C. PVC Pipe and Fitting Assembly:
   1. Solvent: Use type and procedures recommended by pipe manufacturer to make solvent-welded joints. Remove burrs from cut pipe ends and thoroughly clean pipe and fitting of dirt, dust, and moisture before applying primer and solvent.
   2. PVC to Metal Connection: Install metal connection first. Use non-hardening pipe dope, such as Permatex No. 2, on threaded PVC to metal joints. Use only light wrench pressure.
   3. Threaded PVC Connection: Where required, use threaded PVC adapters to which pipe may be welded. Apply appropriate tape or thread compound to outside threads.

D. Copper Tubing and Fitting Assembly:
   1. Clean pipe and fitting thoroughly. Buff connection with sand paper to remove pipe residue.
   2. Flux pipe and fitting. Solder connection using 50-50 soft solid core solder.

E. Install sprinklers after hydrostatic test is completed.

F. Bubblers:
   1. Install bubblers as designated on the approved design drawings. Make appropriate adjustments in bubbler layout to accommodate for actual field conditions.
   2. Outlet of bubblers shall be located inside the planting saucer for each plant.

G. Drip Tubing and Emitters:
   1. Install pressure regulating valves after zone valves as required to regulate pressure within recommended range for the polyethylene tubing.
   2. Install tubing and emitters as indicated on the approved design drawings.
   3. Use fittings of the size and type recommended by the manufacturer.
   4. Install 6-inch metal wire staples 3 to 5 feet on center, with two staples installed over every change-of-direction fitting.
   5. Spacing of heads/emitters and inline drip tubing shall not exceed maximum indicated on the approved design drawings, or manufacturer's recommendations, whichever is less.

H. Quick Coupler Valve:
   1. Install with underside of flange flush with finish grade. Attach to sprinkler mains with 3-ell, PVC, swing joint.
   2. Quick coupler valves shall be installed with adequate sized boxes and access to easily operate.

I. Electric Remote Control Valve:
   1. Supply in accordance with equipment list. Size according to approved drawings.
   2. Install true and level. Provide 10" cover over valves, and in accordance with manufacturer's specifications.
   3. Install a 10" green plastic valve box over each valve. Fill to middle of valve with gravel.

J. Wiring:
   1. Provide wire from controller to valves. Provide separate wire from controller to each valve. Provide a common neutral wire with white insulation from controller to each valve.
   2. Lay wire in trenches provided for piping and tuck underneath piping.
   3. Conduit is not required for UF wire, except under paved areas.
   4. Make wire connections with waterproofing connectors according to manufacturer's recommendation.

K. Boxes: All boxes installed flush with grade, boxes installed without distortion so that covers fit snugly into boxes. Boxes installed so that covers do not fit into the box, sit on grade, or rotate or come loose under foot traffic or mower wheels is not acceptable and shall be properly re-set.

L. Irrigation Controller:
   1. Install according to manufacturer's recommendation.
   2. Install at location shown on approved drawing, or if not shown, as instructed by Architect.
   3. Connect to power supply within EMT conduit, with water tight fittings. Securely fasten conduit to wall in an approved manner.
   4. Install rain and freeze sensors in locations as acceptable to Architect.

M. Miscellaneous Equipment:
   1. Install all assemblies specified herein according to the respective detail drawings or specifications, using best standard practices.
   2. Install devices such as rain sensors, flush valves, air relief valves, master valves and flow sensors as indicated on the approved design drawings and as recommended by the manufacturer.

3.04 TESTING

A. General: Provide Owner’s representative 72 hours notice notice in advance of required testing and inspections, and final leak test prior to backfilling, should Owner's representative wish to attend.

B. Sprinkler Main: Test for a period of 12 to 14 hours under normal water pressure. If leaks occur, correct defective construction and repeat test.

C. Lateral Piping: Test for a period of one hour under normal water pressure. If leaks occur, correct defective construction and repeat test.

D. Make repairs and repeat testing until no leaks exist.

E. Complete testing prior to backfilling. Partial backfill may be placed in trenches between fittings to insure stability of line under pressure. Leave fittings and couplings open to visual inspection for full period of test.

3.05 FINAL ADJUSTMENT

A. Make final adjustments prior to inspection by Architect or Owner’s representative.

B. Completely flush system to remove debris from lines by removing nozzles from heads on ends of lines and turning on system. Replace nozzles and check system operation of each section to ensure no debris will obstruct proper operation. If any head fails to operate properly, repeat entire operation and re-flush.

C. Valves: Check use of flow adjustment on top of each valve in each section of heads for operating pressure and balance to other sections. Automatic control valves or pressure

regulating valves as applicable, are to be adjusted so that the irrigation heads, drip emitters and inline drip tubing operate at the pressure recommended by the manufacturer.

D. Check all sprinklers for proper operation, coverage, and alignment of throw direction. Prevailing wind conditions or slopes may indicate that arc of angle / trajectory of spray should be other than as shown on approved drawings. Change nozzles to provide correct coverage without additional cost to Owner.

3.06 CLEANING

A. During work, keep premises neat and orderly. Remove trash and debris daily from site.
   1. If site is occupied by Owner, or for irrigation work installed after general site cleaning, maintain drives and paving areas free of dirt and debris from irrigation work on daily basis.

3.07 REPAIRS

A. Maintenance / Warranty Period Repairs: Contractor shall repair damages sustained to property or equipment. Repairs to Irrigation System must be completed by licensed City-approved irrigator.

B. Temporary Repairs by Owner: The Owner reserves the right to make temporary repairs as necessary to keep sprinkler system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the Guarantee, as herein specified.

3.08 DEMONSTRATION

A. Demonstrate system operation and instruct Owner's personnel in operation and general maintenance of system. Provide required keys and maintenance tools at time of Owner training. Provide as-built drawings and zone map at or before time of Owner training. Provide landscape installer's recommended watering schedule at or before time of training. At conclusion of training, watering program shall be set to landscaper's recommended schedule for establishing plantings.

3.09 MAINTENANCE

A. Provide maintenance of system, including cleaning / adjustment of heads, raising and lowering of heads, and re-programming of watering schedule, for one year after final acceptance, as part of installation scope.

B. Repair backfill settlement of trenches during one year corrective period.

C. Drain and flush system at end of one year Guarantee period.

D. At times as directed by Landscaping installer, adjust watering schedule programming during the maintenance period. Also adjust watering schedule during the maintenance period as required by authorities having jurisdiction for applicable watering restrictions. At end of maintenance period / final acceptance of landscaping, provide recommended continued watering schedule to Owner and set the watering schedule on the controller accordingly unless otherwise directed by Owner.
   1. If otherwise required by current watering restrictions of authorities having jurisdiction, set second watering program to comply with the watering restrictions currently in force and set controls to use the compliant watering program.

END OF SECTION 32 84 00

SECTION 32-9000 – LANDSCAPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes: Provide complete landscaping shown on Drawings, and as herein specified.
   1. Plants and Planting.
   2. Planting Soils.
   3. Fertilizer.
   4. Tree Stabilization.
   5. Tree Branch **[and Root]** Pruning.
   6. Landscape Edging.
   7. Weed Block Membrane / Filter Fabric.
   8. Mulch.

B. Related Sections include the following:
   1. Division 12 Section - Site Furnishings.
   2. Division 31 - Earth moving for excavation, filling, and rough grading and for subsurface aggregate drainage and drainage backfill materials.
   3. Division 32 Section - Landscape Irrigation.
   4. Division 32 Section - Turf and Grasses.

1.03 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than sizes indicated and diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than sizes indicated and diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of plant required.

E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

F. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

H. Finish Grade: Elevation of finished surface of planting soil.

I. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

J. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
K. Planting Area: Areas to be planted.
L. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
M. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
N. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
O. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.04 REFERENCED STANDARDS:

A. American Standard for Nursery Stock, approved October 27, 1980 by American National Standards Institute, Inc.
B. Hortus Third, 1976 - Cornell University

1.05 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, including soils.
   1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
   2. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to the Project.
   3. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
B. Samples for Verification: For each of the following:
   1. Trees and Shrubs: Two samples of each variety and size delivered to the site for review. Maintain approved samples on-site as a standard for comparison.
   2. Mulch: 1-quart volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
   3. Mineral Mulch: 2 lb of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on the site; provide an accurate indication of color, texture, and makeup of the material.
   4. Weed Control Barrier: 12 by 12 inches.
   5. Edging Materials and Accessories: Manufacturer's standard samples or color selector, to verify color selected.

1.06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
B. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Include in O&M manual.
C. Warranty: Sample of special warranty.

1.07 CLOSEOUT SUBMITTALS

A. Organize O&M materials with title sheet including name and contact information of landscape installer.
   1. Provide list of plant materials used along with the following information:
      a. Common and scientific names.
      b. Explicit maintenance and care instructions after the Contractor's establishment and maintenance period, for each plant material installed except for annuals. Different species plants may use the same instructions where appropriate.
   2. Warranty.
B. Coordinate with irrigation installer, if other than landscape installer, to provide recommended watering schedule. (Refer to Division 32 - Section "Landscape Irrigation".)

1.08 QUALITY ASSURANCE

A. Provide plant materials in compliance with applicable State and Federal laws relating to inspection for diseases and insect infestation at growing site.
B. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.
   1. Experience: Five years' experience in landscape installation in addition to requirements in Division 01 Section "Quality Requirements."
   2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
   3. Pesticide Applicator: State licensed, commercial.
C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
D. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
   1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
   2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
E. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1.09 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials.
B. Preparation for Delivery:
   1. Balled and Burlapped (B&B) Plants: Dig and prepare shipment in a manner that will not damage roots, branches, shape, and future development.
   2. Container Grown Plants: Container shall be sufficiently rigid to hold ball shape and protect root mass during shipping.
   3. Do not prune trees and shrubs before delivery. Provide protective covering of plants during shipping and delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Protect during delivery to prevent damage to root ball or desiccation of leaves. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape.
   4. Do not drop plants during delivery and handling.
C. Bulk Materials:
   1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

D. Delivery: Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
1. Packaged materials delivered in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable. Protect materials from deterioration during delivery and while stored at site.
2. Notify Architect of delivery schedule 48 hours in advance so plant material may be observed upon arrival at job site.
3. Do not deliver more plant materials than can be planted in one day unless adequate storage and watering facilities are available on job site.
4. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material. If balled trees and shrubs cannot be planted within 24 hours after delivery to site, protect root balls by heeling in with saw dust or other approved material.
5. Do not remove container-grown stock from containers before time of planting.
6. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.
7. Remove rejected plant material immediately from site.

E. Handling: Handle planting stock by root ball. Do not lift, move, adjust to plumb, or otherwise manipulate trees and plants by trunk or stems.

1.10 JOB CONDITIONS:

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Perform actual planting only when weather and soil conditions are suitable in accordance with locally accepted practice for species indicated.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

D. Protections:
1. Do not move any equipment over existing or newly placed structures without approval of Architect and General Contractor. Provide necessary protections such as board-roading as required.
2. Do not allow equipment and materials movement, or storage, in landscape areas or over root systems.

E. Coordination:
1. Coordinate dimensions of limestone benches with hardscaping dimensions.
2. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated. When planting trees, shrubs, and other plants after planting turf areas or in existing turf areas, protect turf and promptly repair damage caused by planting operations.
3. Determine locations of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, if required, to minimize possibility of damage to underground utilities. Maintain grade stakes and utility marking set by others until removal is mutually agreed upon by parties concerned.

4. Coordinate rough and landscape grading, soil preparation, irrigation, and other related units of Work specified in other Sections to ensure that plant material can be supported and installed as indicated.
5. Coordinate watering schedules during installation and until Final Acceptance. Provide deep root watering to keep root balls moist on newly installed trees at a minimum of once every two weeks during summer months or as weather conditions indicate.

1.11 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
      b. Structural failures including plantings falling or blowing over.
      c. Faulty performance of tree stabilization and edgings.
      d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   2. Warranty Period: 1 year from Date of Completion of all Planting for the project.
   3. Include the following remedial actions as a minimum:
      a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
      b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
      c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
      d. Provide extended warranty for period equal to original warranty period, for replaced plant material, due to failure to comply with requirements.
   4. Contractor shall replace plants and trees with same kind and size as originally planted and dispose of dead material at no cost to Owner. Trees should be replaced at start of next planting or digging season. In such cases, remove dead trees immediately. Protect irrigation system and other piping conduit or other work during replacement. Repair any damage immediately.

1.12 MAINTENANCE SERVICE

A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3 of these specifications. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.
   1. Maintenance Period: 3 months for landscape plantings and 12 months for trees

PART 2 - PRODUCTS

2.01 PLANT MATERIAL

A. General: Plants shall be equal to well-formed No. 1 grade or better nursery stock in accordance with requirements of applicable standards and as noted herein subject to Architect's approval. Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
3. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls. Listed plant heights are from tops of root balls to nominal tops of plants.
4. Do not prune prior to delivery.

B. Vigor: Plants shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free of disease, insect pests, eggs, or larvae. They shall have healthy, well-developed root systems. Plants shall be free from physical damage or adverse conditions which would prevent thriving growth.
   1. Plants shall have normal, well-developed branches and vigorous, fibrous root systems, conforming to the specifications of the last edition of ANSI Z60.1, Standards for Nursery Stock published by the American Association of Nurserymen, Inc. (A.A.N.)

C. Container Stock: Verify that all container stock has been grown in the containers in which delivered for at least six (6) months, but not over two (2) years. Samples must prove to be free of kinked, circling or girdling roots and with no evidence of a pot-bound condition. Do not install container plants that have cracked or broken balls of earth when taken from container. Field grown plants recently transplanted into containers will not be accepted.

D. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

E. Ornamental and Shade Trees: No. 1 grade nursery stock healthy, vigorous, full-branched, well-shaped, trunk diameter, and height requirements as specified:
   1. All trees and shrubs shall be container grown nursery stock.
   2. Insure balls are firm, neat, slightly tapered, and well burlapped. Reject trees with loose or broken balls at time of planting
   3. Trees will be individually approved or rejected by the Owner's Representative on site.
   4. Root balls: Minimum 10-inches in diameter for each 1-inch caliper, measured 6-inches above root ball.
   5. Trees: Free of physical damage such as scrapes, bark abrasions, or split or broken branches. Contractor shall prune trees as directed by the Owner's Representative, at no additional fee.
   6. Provide trees with full rounded crowns, meeting height and spread standards after pruning. No flat sided trees or trees with open areas on any side will be acceptable. Trees shall be consistently superior in form and branching, and typical of the growth habit of their species unless otherwise specified.

F. Shrubs, groundcovers, perennials and annuals: Nursery grown, healthy, vigorous, of normal habit of growth for species, free from disease, insect eggs, and larvae. Specified sizes are before pruning and measured with branches in normal position. Plants to be well rooted and established in the container.

G. Hydro-mulch seeding:
   1. Fiber: Shall be one hundred (100%) percent Wood Cellulose Fiber, delivered to the site in its original unopened container, Conweb or equal.
   2. Fiber Tack: Shall be delivered to the site in its original unopened container, and shall be Terra-Tack One, as manufactured by Grass Growers, Inc., or equal.

2.02 INORGANIC SOIL AMENDMENTS

A. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

B. Sand: Clean, washed, natural or manufactured, and free of toxic materials.

C. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
D. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.03 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
   1. Organic Matter Content: 50 to 60 percent of dry weight.
   2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
B. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.

2.04 FERTILIZERS

A. Fertilizers, General: Incorporate at rates and composition as recommended for planting beds by manufacturer and plant nursery for local conditions and plant species indicated.
   1. Where such recommendations are not available, determine by soil testing.
B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.
C. Slow-Release Fertilizer: Granular or pelleted complete fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium.
D. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

2.05 PLANTING SOILS

A. Planting Soil:
   1. Planting Soil for planting beds and trees: Living Earth Technologies planting mix "Professional Bedding Soil", or other comparable planting soil as approved by Architect.
B. Native Topsoil: Existing, native surface topsoil formed under natural conditions with the duff layer retained during excavation process and stockpiled on-site. Verify suitability of native surface topsoil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
   1. Supplement with imported topsoil of similar quality when native quantities of satisfactory material are insufficient.
C. Planting Mixes: Mix existing, native surface topsoil with the following soil amendments and fertilizers in the following quantities to produce final planting soil:
   1. At trees, incorporate fertilizer into native topsoil at recommended rate and fill excavation to 6"-8" from grade.
   2. At tree planting and landscape beds, mix planting soil and topsoil in equal quantities by volume. Incorporate fertilizer into planting mix at recommended rate. Apply at depth of 6"-8" layer of mixed soil.

2.06 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
   1. Shredded Wood Mulch: Shredded Native Cedar
      a. Size Range: 3 inches maximum, 1/2 inch minimum
      b. Color: Natural.
   2. Bark Nugget / Chip Mulch: Coarse-graded, Native Hardwood Bark Chips.

3. Crushed Pecan Shell Mulch.

2.07 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids.
   1. For beds not utilizing ground cover, provide Henry Company “HE183" yellow glass fabric, or equal.
   2. For beds utilizing ground cover, provide “Mirafi 140 N” filter fabric, or equal.
   3. Provide with staples, spikes and accessories of types as recommended by fabric Manufacturer for complete installation for applications indicated.

2.08 PESTICIDES

A. General: Pesticide registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.09 TREE STABILIZATION MATERIALS

A. Root-Ball Stabilization Materials:
   1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated; stakes pointed at one end.
   2. Wood Screws: 2-1/2" drywall screws, unfinished.
B. Stakes and Guys:
   1. Upright and Guy Stakes: Rough-sawn, sound, new softwood with specified wood pressure-preservative treatment, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
   2. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.
   3. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.
      a. Guy Cables at trees 5" and larger in caliper: Five-strand, 3/16-inch- diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.
   4. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.

2.10 LANDSCAPE EDGINGS

A. Steel Edging: Standard commercial-steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Border Concepts, Inc.
      b. Collier Metal Specialties, Inc.
      c. Russell, J. D. Company (The).
      d. Sure-Loc Edging Corporation.

2. Edging Size: 1/4 inch wide by 5 inches deep
3. Stakes: Tapered steel, a minimum of 12 inches long.
4. Accessories: Standard tapered ends, corners, and splicers.
5. Finish: Black

2.11 MISCELLANEOUS PRODUCTS

A. Wood Pressure-Preservative Treatment: AWPA C2, with waterborne preservative for soil and freshwater use, acceptable to authorities having jurisdiction, and containing no arsenic; including ammoniacal copper arsenate, ammoniacal copper zinc arsenate, and chromated copper arsenate.
B. Root Barriers: Black, molded, modular panels manufactured with 50 percent recycled polyethylene plastic with ultraviolet inhibitors, 85 mils thick, with vertical root deflecting ribs protruding 3/4 inch out from panel, and each panel 18 inches wide.
C. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
D. Burlap: Non-synthetic, biodegradable.
E. Tree Wrapping Material: Do not use.
F. Tree Paint: Do not use.
G. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.
H. Landscape bed drainage materials:
   1. PVC Pipe and fittings: Schedule 40.
   2. Plastic Landscape Drains / Inlets: 6" round plastic catch basin and grate, or other larger sizes where required for adequate drainage and approved by Architect.
   3. Free Draining Aggregate: As specified in Division 31 for free draining aggregate.

2.12 MACHINERY AND EQUIPMENT

A. Pruning and grinding tools shall be maintained in safe working condition; cutting edges shall be kept sharp to make clean cuts at all times.
B. Pesticide and herbicide application equipment maintained in safe working condition; clean and operational to provide even application at recommended rates.

PART 3 - EXECUTION

3.01 LANDSCAPE BED DRAINAGE REQUIREMENTS

A. Discrepancies: Submit in writing, all discrepancies in the Drawings or Specifications, obstructions on the site, or prior work done by others, which Contractor feels precludes maintaining proper drainage; include description of all work required for correction or relief of said discrepancies.
B. Prior to placement of concrete, the landscape installer and General Contractor shall jointly review drawings including landscaping, paving, and grading, and shall identify all locations that require landscape bed drainage and coordinate landscape bed drainage requirements and piping to be installed through or under sidewalks and site paving.
C. Coordination of drainage of landscape beds is a requirement of the work of this Section. Where not specifically indicated in Drawings, installation of the following drainage provisions is also a part of the scope of this Section.
   1. The following locations require landscape bed drainage:
      a. Where indicated in Drawings.
      b. Where landscape beds are bounded on all sides by building construction, sidewalks, site paving, or similar impervious cosntruction; and finish grade does not allow the landscape area to drain across adjacent paving without further drainage accommodation.

2. The following provisions shall be made for drainage:
    a. Where specific drainage provisions are indicated in Drawings, provide drainage for those landscaping beds in configuration and sizes indicated.
    b. Where not specifically indicated in Drawings, provide the following:
        1) Where bounded on down-slope side of the landscape bed by sidewalk, drainage may be provided by installing 1" PVC drain pipes cast into the sidewalk at 10' intervals. At landscape bed side, wrap and tie filter fabric on the end of pipe with and bury end of pipe in free draining gravel, below mulch level. On downslope side of sidewalk, daylight end of pipe just at finish grade.
        2) Where the above drainage provision is not feasible, install plastic landscape drainage inlets at 20' on center and within 10' of sides of beds. Install inlets with 2" PVC to daylight through nearest concrete curb to drive aisle; or where approved by Civil Engineer, to tie into nearest other subsurface storm drainage.
            a) Where there is not sufficient fall to such locations, coordinate with Architect for alternate daylight termination for landscape bed drain pipes.
            b) Set inlets at finish grade of planting soil and slope landscape beds slightly to drain inlets.
3. Where drainage is not detailed in Drawings, Contractor is responsible to design and install landscape bed drainage, and this is part of the landscape installer's base scope of services.

3.02 EXAMINATION

A. Examine grade or subgrade upon which work is to be performed. Verify grade elevations, that grading is sufficiently smooth, and that bed areas are left the appropriate number of inches low to receive indicated planting soil. Observe conditions under which work is to be performed.
B. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
    1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
    2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
    3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
    4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.
D. Notify General Contractor of any unsatisfactory conditions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03 SITE PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
C. All lumps, clods, and debris over 2-inches in diameter shall be broken up to smaller size or removed from the Work site. Do not proceed with work until all grading and related work is completed in a satisfactory manner so that the landscape installation can proceed.

3.04 PLANTING BED PREPARATION

A. Loosen subgrade of planting areas to a minimum depth of 8 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property. Smooth out subgrade ready to receive planting mix.
B. Apply planting mix soil, fertilizer, and necessary soil amendments on surface, and thoroughly blend planting soil. Do not spread soil if planting soil or subgrade is frozen, muddy, or excessively wet.
    1. Add soil amendments at rates as determined by soil testing lab.
    2. Add commercial fertilizer, at a rate of four pounds per 100 SF of bed area and mix thoroughly.
        a. Fertilizer type(s) as recommended for plant types indicated, and according to locally accepted industry practices.
        b. Delay mixing fertilizer with planting mix soil if planting will not proceed within a few days.
    3. Spread prepared planting soil mix to a depth of 8 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
C. For Azalea beds, modify procedure above to provide twelve inches deep of the following soil mix:
    1. 4 parts peat (hyphum or sphagnum only).
    2. 1 part sharp sand.
    3. Fertilizer as above.
D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
    1. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
E. Wet soil mix as required to optimum moisture content for planting operations.
F. Install weed-control filter fabric according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches and secure seams and edges with galvanized landscaping fabric pins or staples.

3.05 PLANTING IN PLANTERS

A. Coordinate planting operations with irrigation installation.
B. Place a layer of drainage gravel at least 4 inches thick in bottom of planter. Cover bottom with filter fabric and wrap filter fabric 4 inches up on all sides. Duct tape along the entire top edge of the filter fabric, to secure the filter fabric against the sides during the soil-filling process.
C. Fill planter with lightweight on-structure planting soil. Place soil in lightly compacted layers to an elevation of 2-1/2 inches below top of planter. Water thoroughly to settle and to verify planter is draining properly. Add planting soil on top of settled soil to within:
    1. 2-1/2 inches below top of planter, for installation indicated for mulch. (Planters shall receive organic mulch unless specifically indicated otherwise).
    2. 1-1/2 inches below top of planter, for planters indicated not to be mulched.
D. Plant as indicated in other articles.
E. Install 2" mulch layer unless otherwise indicated.

3.06 SHRUB AND GROUNDCOVER PLANTING

A. Place plants in position on bed areas before containers or wrapping have been removed.
B. Obtain approval from Architect of plant positions prior to planting. Provide not less than 3 days notice of time planting layout will be ready for review.
    1. The Architect reserves the right to require to interchange or shift locations of plants prior to planting.
C. Plant in locations and spacings indicated. Cut filter fabric in "x" shape cuts and remove portion of fabric where required for stems. Excavate the shrub or groundcover pit to depth of

root ball and 2 times diameter of root ball, setting plants with tops of balls even with tops of beds, and compact soil carefully around each plant ball. Use planting soil mix for backfill. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

D. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
E. Carefully prune plants to remove dead or broken branches and hand-rake bed areas to smooth even surfaces.
F. Apply specified mulch.

3.07 PLANTING AREA MULCHING

A. Mulch backfilled surfaces of planting areas and other areas indicated.
   1. Organic Mulch: Apply 4-inch average thickness of organic mulch where indicated over whole surface of planting area, and finish level with adjacent finish grades, or 1/4" below adjacent concrete or pavers.
   2. Mineral Mulch: Apply to thickness shown in Drawings, or where not shown to 2-inch thickness (4-inch maximum thickness), of mineral mulch extending over whole surface of planting area, and finish level with adjacent finish grades where bounded by concrete or pavers, or 1/4" below top of adjacent metal edging.
   3. Do not place mulch within 3 inches of trunks or stems.

3.08 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
   1. Excavate at least two times as wide as ball diameter.
   2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
   3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
   4. Maintain required angles of repose of adjacent materials. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
   5. Maintain supervision of excavations during working hours.
   6. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
B. Topsoil removed from excavations may be used in planting soil mix as defined in part 2. Do not incorporate subsoils into planting soil mix.
C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

3.09 TREE PLANTING

A. Stake location of trees for approval by Architect prior to excavating tree pits.
B. Tree Planting:
   1. Percolation test: After approval of tree locations, excavate pit and perform percolation test. The pit should be the same depth as the height of the root ball or slightly less so that the root ball sits no more than one inch above surrounding grade. The pit should be dug pits 12-inches or more greater in diameter than root balls. Fill excavated pits with water and wait until next day. If the water level has not dropped at least six inches within 12 to 24 hours, then install tree drainage system as detailed and specified. If the water level drops more than six inches, a tree drainage system may not be required. An Owner’s Representative must be present to monitor and record the results of the

percolation test. Receive approval from Owner's Representative for extent and layout of proposed tree drainage system.

2. Install tree drainage system as specified if needed.
3. Till soil to 12-inch depth within 10-foot radius of tree.
4. Remove soil and trim any girdling roots at the base of the tree trunk to expose the tree's natural root flare prior to installation in the tree pit. Remove injured roots by cutting cleanly; do not break.
5. Excavate the tree pit to allow for top of tree root ball at the root flare to be 1-inch above the finished grade.
6. Backfill to depths of root balls with planting media consisting of 4 parts native soil to 1 part compost, except within top 8" use planting soil as defined in part 2. Coordinate required depth in areas of paver installation. Carefully settle by watering to prevent air pockets. All backfilling shall be don in maximum of 9-inch layers and watered in thoroughly. Backfill to 1" below adjacent grade, in preparation for top dressing.
7. If rock, concrete, or other below grade obstruction is encountered:
   a. Architect may select alternative location if possible.
   b. Rock shall be removed to a minimum of 6-inches below the plant if an alternative location cannot be selected.

C. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball, and to blend into adjacent grades at slope no greater than 3 units horizontal to 1 unit vertical unless specifically approved otherwise by Architect.
D. Complete tree stabilization as detailed immediately after trees are planted.
E. Top Dressing: After planting has been completed and approved, top dress bed areas and tree root balls first with 2-inches compost to settle to a depth of 1-inch, and form compost into tree watering ring. Then fill inside of watering ring with indicated mulch to a minimum 2-inches depth.
   1. Delay this operation until near final acceptance, or else repair aesthetic deficiencies just prior to Architect's inspection.
   2. Hold compost and mulch back 4 to 6 inches to expose the flare of the tree trunk at the root ball.

3.10 TREE STABILIZATION

A. Stabilize trees immediately after planting.
B. Install root-ball stabilization as follows for all trees 2" and greater in caliper unless otherwise indicated at trees planted on slopes greater than 1:3.
   1. Stabilize trees 2" and greater in caliper with four (4) 2x2 x minimum 4' long, new untreated wood stakes, with minimum 18" of tapered end. Install root ball stabilization stakes adjacent to the root ball and extending below the base of the root ball to a depth that firmly anchors the tree and root ball to the unexcavated soil. Remove excess of stake length above grade as required so that root ball stabilization stakes will be concealed by mulch layer. Attach two 2x2 untreated wood cross members to the four stakes with 2-1/2" long drywall screws per standard City of Plano details. The cross members shall be oriented parallel to the prevailing wind at the project site and shall be shall be four feet long or extend to a minimum of 8" beyond the excavation of the tree into the undisturbed edge of the tree pit.
   2. Stake trees of less than 2-inch caliper only as required to prevent wind tip out.
C. Install trunk stabilization (staking) as follows unless otherwise indicated: Stake all trees not stabilized by root ball stabilization unless otherwise indicated.
   1. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes for trees of 2-1/2 inch caliper and below and minimum of 3 stakes for larger trees. Space stakes equally around trees. Stakes shall be of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend to at least 3 feet

above grade or to one-third of trunk height, whichever is higher. Set vertical stakes and space to avoid penetrating root balls or root masses.
    a. At trees over 5-inch caliper, and trees with top-heavy canopies, use metal tee posts in lieu of wood posts.
2. Support trees by one of the following methods. Allow enough slack to avoid rigid restraint of tree.
    a. Using bands of flexible ties at contact points with tree trunk.
    b. Using two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk.

3.11 EDGING INSTALLATION

A. Install metal edging per Manufacturer's installation instructions, in locations indicated and to separate grass areas from ground cover and landscape bed areas. Set edging as indicated in true lines as designed with top of edging 1-inch above finish grade.

3.12 ROOT-BARRIER INSTALLATION

A. Install root barrier where large canopy trees are planted within 60 inches of slab on grade building foundations, paving or other hardscape elements, such as walls, curbs, and walkways unless otherwise indicated on Drawings.
B. Align root barrier with bottom edge angled at 20 degrees away from the paving or other hardscape element and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.
C. Install root barrier continuously for a distance of 60 inches in each direction from the tree trunk, for a total distance of 10 feet per tree. If trees are spaced closer, use a single continuous piece of root barrier.
    1. Position top of root barrier per manufacturer's recommendations.
    2. Overlap root barrier a minimum of 12 inches at joints.
    3. Do not distort or bend root barrier during construction activities.
    4. Do not install root barrier surrounding the root ball of tree.

3.13 STABILIZED DECOMPOSED GRANITE PATHWAY

A. General
    1. Verify location and layout of aggregates with Owner’s Representative prior to commencing work.
    2. Provide excavation as detailed in the drawings to achieve aggregate sub-base.
    3. Apply non-selected post-emergent herbicide (“Roundup” or approved equal) to sub-base soil in area of filter fabric to remove any weeds.
    4. Prepare and compact subgrade as indicated in Drawings and in compliance with stabilizer manufacturer's recommendations.
    5. Edge aggregate beds with steel edging per details.
    6. Underlay area to receive aggregate with two layers of filter fabric with each layer laid perpendicular to the other. Apply filter fabric on bottom and sides of bed.
B. Blending stabilizer: Blend 12 to 16-lbs (call manufacturer for exact blend) of Stabilizer per 1-ton of decomposed granite or crushed 3/8” or .” minus aggregate screenings. It is critical that Stabilizer be thoroughly and uniformly mixed throughout decomposed granite or crushed .” or 3/8” minus aggregate screenings. Bucket blending is not acceptable. Blending with a rake and or shovel is not acceptable. Blend material dry as water will make the material hard.
C. Placement:
    1. After pre-blending, place the Stabilized decomposed aggregate or 3/8” or 1/4” crushed aggregate screenings on prepared sub-grade. Level to desired grade and cross section.
    2. Depth of pathways – 3” for heavy foot traffic and light vehicles.
D. Watering: Water heavily for full-depth moisture penetration of the Stabilized pathway profile. Water activates Stabilizer. To achieve saturation of Stabilized pathway profile, 25 to 45-

gallons of water per 1-ton must be applied. During water application randomly test for depth using a probing device, which reaches full depth.

E. Compaction
   1. Upon thorough moisture penetration, compact aggregate screenings to 85% relative compaction by equipment such as; a 2 to 4-ton double drum roller or a 1,000-lb. single drum roller. The roller size will depend on the depth of the pathway. DO NOT use a vibratory plate compactor or vibration function on roller as vibration separates large aggregate particles. Do not begin compaction for 6 hours after placement and up to 48 hours.
   2. If surface aggregate dries significantly quicker than subsurface material, lightly mist surface before compaction.
   3. Take care in compacting decomposed granite or crushed 3/8” or minus aggregate screenings when adjacent to planting and irrigation systems. Hand tamp with 8” or 10” hand tamp as required to avoid damage to root systems and irrigation heads.

F. Inspection: Finished surface of pathway shall be smooth, uniform and solid. There shall be no evidence of chipping or cracking. Cured and compacted pathway shall be firm throughout profile with no spongy areas. Loose material will not be present on the surface after installation, but may appear after use and according to environmental conditions. Pathway should remain stable underneath the loose granite on top. It is a “natural” looking pathway, yet stable throughout. Any significant irregularities in path surface shall be repaired to the uniformity of entire installation.

3.14 TREE AND SHRUB PRUNING

A. Newly planted materials pruning: Unless directed by Owner's Representative, do not cut tree leaders, and remove only injured or dead branches and do not prune for shape. Any pruning shall be in accordance with horticultural best practices. If after pruning, the tree or shrub become misshapen or changed in appearance, the plant will be rejected.
   1. Additionally prune, thin, and shape trees and shrubs only if so directed by Architect or Owner's Representative.

B. Maintain cutting tools in sharp condition at all times as required to make clean cuts. Cuts should be made slightly out of vertical plane and at angles so as to shed rain and avoid collecting water. Tie off and lower branches to ground in controlled manner. Do not allow cross traffic of any kind during pruning operations below work areas where branches may fall; provide designated spotter, temporary barriers and warning signs as required.

C. Do not apply pruning paint to wounds of newly planted trees and shrubs, or to smaller wounds of existing trees to be pruned.

3.15 MAINTENANCE BY CONTRACTOR

A. The Contractor is responsible for maintenance of all trees, shrubs, ground cover and turf, including all necessary watering, cultivating, weeding and spraying until substantial completion of the entire project. Plant materials shall be kept in a healthy and vigorous condition with all bed areas kept neat.

B. Water will be available on site at no expense to the Contractor. Hose and other watering equipment required for maintenance by Contractor shall be furnished by Contractor at his expense. Additional water will be available as sprinkler system becomes operational, but this in no way relieves the Contractor of maintenance of plant material until acceptance by the Owner.

C. Grass areas shall be mowed at regular intervals to maintain a maximum height of two inches. Do not cut more than 1/3 of grass blade at any one mowing. Remove clippings after mowing.

3.16 MAINTENANCE AND ESTABLISHMENT

A. General: Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish

healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.

1. Trees and plants shall be routinely inspected for distress due to pests, lack of water or flooding, and other natural causes, and for distress or damage caused by construction activities. Notify General Contractor immediately at first sign of distress due to the construction activities of other trades.

B. Fill in soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost due to subsidence.

C. Watering:

1. Trees and large shrubs: Deep root water all existing trees in protected areas and newly transplanted trees once every two weeks during the summer and once a month during the winter, during the duration of the project and until Final Acceptance. Adjust watering due to the amount of rainfall. However, unless it has rained at least ½-inch since the last watering, continue to deep root water.
2. Other Plants: Water plants routinely as required for establishment and to maintain plants in vigorous condition. Where watering will be by irrigation system coordinate with irrigation installer, if other thand landscape installer, to adjust watering schedules as required.

D. Protected Existing Trees and New Trees: Maintain existing protected trees until acceptance of plantings and after construction activity that may affect existing trees is completed. Maintain new trees until end of establishment and maintenance period, whichever is later.

1. Any fire ant mounds around or on top of a tree root zone shall be treated immediately and the mound removed physically. Do not allow the mound to build on the tree trunk as this will cover the tree root flare and possibly cause injury or death. Ensure that any chemical application to the fire ant mound is safe for application atop tree root zones.
2. Trees: Pruning will be carried out by experienced pruning personnel.
    a. Receive approval in the field for extent of pruning from Owner’s Representative.
    b. Sterilize pruning tools between individual plants, especially in the genus Quercus. Paint all wounds greater than 3" diameter on plants of the genus Quercus with wound paint as soon as possible. Paint deliberate wounds (pruning) within 1 hour. Clean cut and paint accidental wounds (storm or equipment damage, or vandalism) as soon as they are observed.
    c. Raise limbs to an acceptable height as approved by the Architect. Raise limbs to seven foot height for trees located within 10-feet of vehicular paving or sidewalk.
    d. No weed-eaters or edgers are to be used within 15-inches of any tree. Should the need for trimming be necessary within 15-inches of any tree, it shall be done so by hand trimming only.
    e. Remove dead wood, broken branches, mistletoe and suckers from trees as needed.

E. Herbicides and Pesticides: Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use of integrated pest management practices is encouraged whenever possible to minimize the use of pesticides and reduce health and environmental hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents. Maintain plantings in continuous weed-free condition until acceptance of planting. Apply pesticides as required to treat for specific pest activity observed before substantial damage to plant material. However, limit application of pesticides to the minimum necessary to ensure plant health.

1. Regard all herbicides and pesticides as hazardous to health and dangerous to the environment; chemicals should be handled with extreme caution and only by experienced personnel. Read and follow all label directions and apply in manner to comply with local, state and federal guidelines and manufacturer's instructions. Limit public access to any area recently treated.
2. Coordinate applications with Owner's operations and others in proximity to the Work. Contractor shall obtain prior approval from the Architect before applying herbicides and pesticides.

a. Due to potentially toxic materials, do not schedule application of herbicides or pesticides at Owner-occupied site without first notifying Owner and receiving Owner's written approval to apply at the time indicated.

3. The Contractor shall be held solely responsible for plant loss due to the application of herbicides. Any loss of plant material shall be replaced at Contractor's sole expense and all plant replacements shall be of the same species and size of the existing plant materials.

F. Fertilizing: Apply additional fertilizer during the establishment and maintenance periods, as deemed by Contractor to be beneficial to promote health and establishment of plantings. Fertilizers shall be of type and composition as determined by Contractor to establish plants in vigorous condition, and to address nutrient deficiencies observed by Contractor during his routine inspections.

3.17 CLEANUP AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Do not obstruct access to occupied buildings. Clean paving and adjacent areas at end of each day's operations.

B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and the Project site.

3.18 DISPOSAL

A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 32 90 00

SECTION 32-9200 – TURF AND GRASSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Seeding.
   2. Hydroseeding.
   3. Sodding.
   4. Plugging.
   5. Sprigging.
   6. Meadow grasses and wildflowers.
   7. Turf renovation.
   8. Erosion-control material(s).
   9. Grass paving.

B. Related Sections:
   1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
   2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
   3. Division 32 Section "Porous Unit Paving" for concrete grid-type pavers shaped to provide open areas between units, planted with grass or other plants.
   4. Division 32 Section "Planting Irrigation " for turf irrigation.
   5. Division 32 Section "Plants" for border edgings.
   6. Division 33 Section "Subdrainage" for subsurface drainage.

1.03 DEFINITIONS

A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.

B. Finish Grade: Elevation of finished surface of planting soil.

C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.

1.05 INFORMATIONAL SUBMITTALS

A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
   1. Certification of each seed mixture for [turfgrass sod] [plugs]. Include identification of source and name and telephone number of supplier.
B. Qualification Data: For qualified landscape Installer.
C. Product Certificates: For [oil amendments and fertilizers, from manufacturer.
D. Material Test Reports: For standardized ASTM D 5268 topsoil.
E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of tur during a calendar year. Submit before expiration of required initial maintenance periods.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf[and meadow] establishment.
   1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
   2. Experience: Five years' experience in turf installation in addition to requirements in Division 01 Section "Quality Requirements."
   3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
   4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
      a. Certified Landscape Technician - Exterior, with installation area(s), designated CLT-Exterior.
      b. Certified Turfgrass Professional, designated CTP.
      c. Certified Turfgrass Professional of Cool Season Lawns, designated CTP-CSL.
   5. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
   6. Pesticide Applicator: State licensed, commercial.
B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of the soil.
   1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
   2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of [three] <Insert number> representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
   3. Report suitability of tested soil for turf growth.
      a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.

b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.

D. Preinstallation Conference: Conduct conference at Project site.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod in time for planting within 24 hours of harvesting. Protect sod from breakage and drying.

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.08 PROJECT CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.09 MAINTENANCE SERVICE

A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:

1. Seeded Turf: 60 days from date of planting completion.
   a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
2. Sodded Turf: 30 days from date of planting completion.

B. Continuing Maintenance Proposal: From Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

PART 2 - PRODUCTS

2.01 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as follows:

C. Seed Species: Seed of grass species as follows, with not less than [95] <Insert number> percent germination, not less than [85] <Insert number> percent pure seed, and not more than [0.5] <Insert number> percent weed seed:
   1. Full Sun: Bermudagrass (Cynodon dactylon).
   2. Full Sun: Kentucky bluegrass (Poa pratensis), a minimum of three cultivars.
   3. Sun and Partial Shade: Proportioned by weight as follows:
      a. 50 percent Kentucky bluegrass (Poa pratensis).
      b. 30 percent chewings red fescue (Festuca rubra variety).
      c. 10 percent perennial ryegrass (Lolium perenne).
      d. 10 percent redtop (Agrostis alba).
   4. Shade: Proportioned by weight as follows:
      a. 50 percent chewings red fescue (Festuca rubra variety).
      b. 35 percent rough bluegrass (Poa trivialis).
      c. 15 percent redtop (Agrostis alba).

2.02 TURFGRASS SOD

A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
B. Turfgrass Species: Bermudagrass (Cynodon dactylon)
C. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
   1. Full Sun: Kentucky bluegrass (Poa pratensis), a minimum of three cultivars.
   2. Sun and Partial Shade: Proportioned by weight as follows:
      a. 50 percent Kentucky bluegrass (Poa pratensis).
      b. 30 percent chewings red fescue (Festuca rubra variety).
      c. 10 percent perennial ryegrass (Lolium perenne).
      d. 10 percent redtop (Agrostis alba).
   3. Shade: Proportioned by weight as follows:
      a. 50 percent chewings red fescue (Festuca rubra variety).
      b. 35 percent rough bluegrass (Poa trivialis).
      c. 15 percent redtop (Agrostis alba).

2.03 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
   1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.
   2. Class: O, with a minimum of 95 percent passing through No. 8 sieve and a minimum of 55 percent passing through No. 60 sieve.
   3. Provide lime in form of ground dolomitic limestone.
B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
D. Aluminum Sulfate: Commercial grade, unadulterated.
E. Perlite: Horticultural perlite, soil amendment grade.
F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.
G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.04 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
   1. Organic Matter Content: 50 to 60 percent of dry weight.
   2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.
C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
D. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
   1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15 lb/cu. ft. of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25 lb/cu. ft. of loose sawdust or ground bark.
E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.05 FERTILIZERS

A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.
B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
   1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
   2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
   1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
   2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.06 PLANTING SOILS

A. Planting Soil: ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 2 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth. Mix ASTM D 5268 topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
   1. Ratio of Loose Compost to Topsoil by Volume: 1:4.
B. Planting Soil: Imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.
   1. Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy,

nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass; not infested with nematodes, grubs, other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled, pore-space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

2. Mix imported topsoil or manufactured topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
   a. Ratio of Loose Compost to Topsoil by Volume: 1:4.

2.07 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.
C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent.
D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
   1. Organic Matter Content: 50 to 60 percent of dry weight.
   2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
E. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
F. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
G. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.08 PESTICIDES

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
B. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.09 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.
C. Erosion-Control Mats: Cellular, non-biodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 3-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
   1. Products: Subject to compliance with requirements,available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Invisible Structures, Inc.; Slopetame 2.

b. Presto Products Company, a business of Alcoa; Geoweb.
c. Tenax Corporation - USA; Tenweb.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
   1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
   2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
   3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
   4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.02 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
   1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
   2. Protect grade stakes set by others until directed to remove them.
B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.03 TURF AREA PREPARATION

A. Limit turf subgrade preparation to areas to be planted.
B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
   1. Apply superphosphate fertilizer directly to subgrade before loosening.
   2. Thoroughly blend planting soil off-site before spreading.
      a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
      b. Mix lime with dry soil before mixing fertilizer.
   3. Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
      a. Spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
      b. Reduce elevation of planting soil to allow for soil thickness of sod.
C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
   1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
   2. Loosen surface soil to a depth of at least 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches soil. Till soil to a homogeneous mixture of fine texture.
      a. Apply superphosphate fertilizer directly to surface soil before loosening.
   3. Remove stones larger than 1 inch in any dimension and sticks, roots, trash, and other extraneous matter.

4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.04 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.

C. Fill cells of erosion-control mat with planting soil and compact before planting.

D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.05 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
   1. Do not use wet seed or seed that is moldy or otherwise damaged.
   2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 2 lb/1000 sq. ft..

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with erosion-control mats where shown on Drawings; install and anchor according to manufacturer's written instructions.

F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
   1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
   2. Bond straw mulch by spraying with asphalt emulsion at a rate of 10 to 13 gal./1000 sq. ft.. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

G. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.06 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
   1. Mix slurry with nonasphaltic tackifier.

2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
3. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.

3.07 SODDING

A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
   1. Lay sod across angle of slopes exceeding 1:3.
   2. Anchor sod on slopes exceeding 1:6 with wood pegs[or steel staples] spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.08 TURF RENOVATION

A. Renovate existing turf.
B. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
   1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
   2. Install new planting soil as required.
C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
D. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
E. Mow, dethatch, core aerate, and rake existing turf.
F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
I. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches of existing soil. Install new planting soil to fill low spots and meet finish grades.
J. Apply [seed and protect with straw mulch] [sod] as required for new turf.
K. Water newly planted areas and keep moist until new turf is established.

3.09 TURF MAINTENANCE

A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
   1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.

2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
1. Mow bermudagrass to a height of 1/2 to 1 inch.
2. Mow Kentucky bluegrass to a height of 1-1/2 to 2 inches.

D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.
1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.10 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:
1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.11 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.12 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

C. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 32 92 00

SECTION 33-1416 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water pipe for site conveyance lines.
B. Pipe valves.
C. Fire hydrants.

1.02 REFERENCE STANDARDS

A. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
B. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
C. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
D. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
E. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
F. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
G. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.
H. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm).

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.04 SUBMITTALS

A. See Section 01-3300 SUBMITTAL PROCEDURES, for submittal procedures.
B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
C. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with utility company requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

1.07 WARRANTY

A. See Section 01-7700 CLOSEOUT PROCEDURES, for additional warranty requirements.

PART 2 PRODUCTS

2.01 WATER PIPE

A. Ductile Iron Pipe: AWWA C151/A21.51:
   1. Fittings: Ductile iron, standard thickness.
   2. Joints: AWWA C111/A21.11, Styrene butadiene rubber (SBR) or vulcanized SBR gasket with rods.
   3. Jackets: AWWA C105/A21.5 polyethylene jacket.

B. PVC Pipe: AWWA C900 Class 100:
   1. Fittings: AWWA C111/A21.11, Schedule 40 per ASTM D2466 or schedule 80 per ASTM D2467.
   2. Joints: ASTM D3139 compression gasket ring.
C. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service" in large letters.

2.02 VALVES

A. Valves: Manufacturer's name and pressure rating marked on valve body.
B. Gate Valves 3 Inches and Over:
   1. AWWA C500, iron body, bronze trim, non-rising stem with square nut, single wedge, flanged ends, control rod, valve key, and extension box.

2.03 HYDRANTS

A. Hydrants: Type as required by utility company.
B. Finish: Primer and two coats of enamel in color required by utility company.

2.04 BEDDING AND COVER MATERIALS

A. Bedding: Indicated on drawings.
B. Cover: As specified in Section 31-2323.

2.05 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type specified in Section 03-3000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.02 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
B. Remove scale and dirt on inside and outside before assembly.

3.03 TRENCHING

A. See the sections on excavation and fill for additional requirements.
B. Hand trim excavation for accurate placement of pipe to elevations indicated.
C. Form and place concrete for pipe thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories.
D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.04 INSTALLATION - PIPE

A. Install ductile iron piping and fittings to AWWA C600.
B. Route pipe in straight line.
C. Install pipe to allow for expansion and contraction without stressing pipe or joints.
D. Slope water pipe and position drains at low points.
E. Install trace wire 6 inches above top of pipe; coordinate with Section 31-2323.

3.05 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing.
B. Center and plumb valve box over valve. Set box cover flush with finished grade.
C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.
D. Set hydrants to grade, with nozzles at least 20 inches above ground.

3.06 FIELD QUALITY CONTROL

A. See Section 01-4000 - QUALITY REQUIREMENTS, for additional requirements.
B. Perform testing according to requirements of authorities having jurisdiction.
C. Perform field inspection, disinfection, and testing in accordance with City of York and State of Nebraska requirements.
D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF SECTION

SECTION 33-3113 - SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, and accessories.
B. Connection of building sanitary drainage system to municipal sewers.

1.02 RELATED REQUIREMENTS

A. Section 31-2316 - EXCAVATION: Excavating of trenches.
B. Section 31-2323 - FILL: Bedding and backfilling.

1.03 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.04 REFERENCE STANDARDS

A. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
B. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

1.05 SUBMITTALS

A. See Section 01-3300 SUBMITTAL PROCEDURES, for submittal procedures.
B. Product Data: Provide data indicating pipe, pipe accessories, and _____.
C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
D. Field Quality Control Submittals: Document results of field quality control testing.
E. Project Record Documents:
   1. Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Provide products that comply with applicable code(s).
B. Plastic Pipe: ASTM D3034, SDR 35, Type PSM, Poly(Vinyl Chloride) (PVC) material; bell and spigot style solvent sealed joint end.
C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 PIPE ACCESSORIES

A. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service" in large letters.

2.03 BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: As specified in Section 31-2323.
B. Pipe Cover Material: As specified in Section 31-2323.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in accordance with applicable code(s).

3.02 TRENCHING

A. See Sections 312316 and 312323 for additional requirements.
B. Hand trim excavation for accurate placement of pipe to elevations indicated.
C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.03 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.
B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
C. Connect to building sanitary sewer outlet and municipal sewer system.
D. Install trace wire 6 inches above top of pipe; coordinate with Section 31-2323.

3.04 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.
B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.
C. Establish elevations and pipe inverts for inlets and outlets as indicated.
D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.05 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01-4000.
B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
C. Perform testing according to requirements of authorities having jurisdiction.
D. Deflection Test: Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place and again at completion of Project.

3.06 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 33-4211 - STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stormwater drainage piping.
B. Stormwater pipe accessories.

1.02 RELATED REQUIREMENTS

A. Section 31-2316 - EXCAVATION: Excavating of trenches.
B. Section 31-2323 - FILL: Bedding and backfilling.

1.03 ADMINISTRATIVE REQUIREMENTS

1.04 SUBMITTALS

A. See Section 01-3300 SUBMITTAL PROCEDURES, for submittal procedures.
B. Product Data: Provide data indicating pipe, pipe accessories, and _____.

PART 2 PRODUCTS

2.01 STORMWATER PIPE MATERIALS

A. Plastic Pipe: ASTM D3034, SDR 35, Type PSM, Poly Vinyl Chloride (PVC) material; bell and spigot style solvent sealed joint end.
B. Plastic Pipe: ASTM D3350, High Density Polyethylene (HDPE) corrugated wall pipe with integrally formed smooth liner; meeting the requirements of AASHTO M 252, Type S, for diameters between 3 inches and 10 inches and AASHTO M 294, Type S, for diameters between 12 inches and 60 inches, soil-tight, bell and spigot joints with rubber gaskets, with pipe and fittings manufactured from virgin PE compounds with cell classification 3254420C.

2.02 PIPE ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Stormwater Service" in large letters.

2.03 BEDDING AND COVER MATERIALS

A. Bedding: Indicated on drawings.
B. Cover: As specified in Section 31-2323.

PART 3 EXECUTION

3.01 TRENCHING

A. See Section 31-2316 - EXCAVATION and Section 31-2323 - FILL for additional requirements.
B. Hand trim excavation for accurate placement of pipe to elevations indicated.
C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION

A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
    1. Plastic Pipe: Also comply with ASTM D2321.

B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
C. Connect to building storm drainage system, foundation drainage system, and utility/municipal system.
D. Install continuous trace wire 6 inches above top of pipe; coordinate with Section 31-2323.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection in accordance with Section 01-4000 - QUALITY REQUIREMENTS.
B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
C. Deflection Test: Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill in in place and again at completion of Project.

3.04 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

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