PROJECT MANUAL – 100% CONSTRUCTION DOCUMENTS

Laurinburg North Fire Station

17501 Aberdeen Rd., Laurinburg, NC 28352
Laurinburg, North Carolina

Project No. 2020-062

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CITY OF LAURINBURG
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MECHANICAL, ELECTRICAL, PLUMBING, AND FIRE PROTECTION

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January 19, 2022

PROJECT MANUAL – 100% CONSTRUCTION DOCUMENTS

1.1 PROJECT INFORMATION

A. Notice to Bidders: Qualified bidders are invited to submit bids for Project as described in this Document according to the Instructions to Bidders.

B. Project Identification: Laurinburg North Fire Station

1. Project Location: 17501 Aberdeen Road, Laurinburg, NC 28352.

C. Owner: City of Laurinburg, 303 W. Church Street, Laurinburg, NC 28352

1. Owner's Representative: Mr. Harold Haywood, General Services Director

D. Architect: Creech & Associates, 1000 W. Morehead St., Suite 120, Charlotte, NC 28208.

E. Project Description: The Project consists of building a new fire station for the City of Laurinburg. This is to replace the existing North Fire Station that has been damaged by flooding. The new fire station will be a pre-engineered building with metal siding and a metal roof. The building will have 3 apparatus bays, a kitchen, bathrooms, a day room, a tool room and a training room. There are several alternatives that takes the apparatus bays from 3 to 5 and finishes some of the interior space into separate spaces verses a large common space.

F. Construction Contract: Bids will be received for the following Work:

1. General Contract (all trades).

1.2 BID SUBMITTAL AND OPENING

A. Owner will receive sealed bids until the bid time and date at the location indicated below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:

1. Last Day for Bid Questions: Tuesday, February 1, 2022
2. Last Addendum: Wednesday, February 2, 2022
3. Bid Opening Date: Wednesday, February 9, 2022
4. Bid Time: 2:00 p.m., local time.
5. Location: Hard copies of complete bids are to be **delivered** to the City of Laurinburg Attn: Mr. Harold Haywood, General Services Director, 303 W. Church Street (Room 242), Laurinburg, NC 28352.

B. Bids will be thereafter **publicly opened in the Council Chambers of City Hall (Room 221), 303 W Church Street, Laurinburg, NC 28352.** Precautions for COVID-19 will be in place and based upon the current direction from state officials at the time of bid openings.

C. The City of Laurinburg reserves the right to reject any and all bids and to waive irregularities and informalities in any bids submitted.

1.3 PREBID CONFERENCE

A. A Pre-Bid Conference for all bidders will be held at the Laurinburg City Hall on Thursday, January 27, 2022, at 10:00 AM, local time. Prospective bidders are encouraged to attend. Please adhere to current COVID-19 protocols at time of conference. After the pre-bid meeting, bidders are welcome to review the site conditions on their own. The project site is located at 17501 Aberdeen Rd., Laurinburg, NC

1.4 DOCUMENTS

A. ELECTRONIC Procurement and Contracting Documents: Obtain on/after January 19, 2022 by downloadable link on the City of Laurinburg website at -
https://www.laurinburg.org/business/#purchasing-rfps
Bid questions should be directed to Creech & Associates,
Attn: John Crawford, AIA – jcrawford@creech-design.com
Any verbal questions will not be considered as part of this bid. All questions need to be sent in written form and the response will be part of the addendum process.

1.5 TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. Bidders shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time. Work that is not completed by the established completion date, plus approved extensions, is subject to liquidated damages as follows:
- 1st week = $0/day.
- Weeks 2 & 3 = $300/day (based on 5 days per week).
- Weeks 4 & above = $1,000/day (based on 5 days per week).

1.6 BIDDER'S QUALIFICATIONS

A. Bidders shall meet all North Carolina state and federal requirements for MWBE (HUB) participation.

B. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. A 5% bid bond is required with the submittal of bids. A Performance Bond, Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder. **Provide the bid bond clearly marked as "BID BOND" in a separate envelop and attached to the outside of the envelop of the bid forms/documents.**

END OF DOCUMENT 00 11 16

1.1 INSTRUCTIONS TO BIDDERS

A. AIA Document A701, "Instructions to Bidders," is hereby incorporated into the Procurement and Contracting Requirements by reference.

B. Sample AIA Document A701 is attached for reference.

END OF DOCUMENT 00 21 13

1.1 SUMMARY

A. This Document with its referenced attachments is part of the Bidding Requirements for this Project and is not part of the Contract Documents. It includes the following:

1. Geotechnical Data.

1.2 PROJECT CONDITIONS

A. Geotechnical Data:

1. Subsurface investigation reports have been prepared by an independent agency and are attached to this Document.
2. These reports were obtained by the Owner for reference purposes only and are not a part of the Contract Documents. Test boring records are included for bidders' convenience and information but are not a warranty of subsurface conditions.
3. Prior to construction, Contractor may make his own subsurface investigation to satisfy themselves as to the site and subsurface conditions, but such subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the Architect.

1.3 ATTACHMENTS

A. "Geotechnical Exploration Report" dated June 18, 2021, and prepared by S&ME, Inc., Raleigh, NC.

B. "Stormwater Soil Evaluation Report" dated June 4, 2021, and prepared by S&ME, Inc., Raleigh, NC.

END OF DOCUMENT 00 31 00

Geotechnical Exploration Report
Laurinburg Fire Station
Laurinburg North Carolina
S&ME Project No. 4305-20-096 CO-1

PREPARED FOR:

City of Laurinburg
503 Hall Street
Laurinburg, North Carolina 28352

PREPARED BY:

S&ME, Inc.
3201 Spring Forest Road
Raleigh, North Carolina 27616

June 18, 2021

June 18, 2021

City of Laurinburg
503 Hall Street
Laurinburg, North Carolina 28352

Attention: Mr. Harold W. Haywood, MPA, CLGPO
General Service Director

Care of: John Crawford, Creech & Associates

Reference: **Geotechnical Exploration Report**
Laurinburg Fire Station
Aberdeen Road, Laurinburg, North Carolina
S&ME Project No. 4305-20-096 CO-1
NC PE Firm License No. F-0176

S&ME, Inc. (S&ME) is pleased to submit this geotechnical exploration report for the referenced project site. The work was completed in general accordance with our change order number 4305-20-096 CO-1, dated May 13, 2021. The purpose of our geotechnical services is to explore the subsurface conditions at the site, evaluate those conditions, and provide recommendations for site preparation and foundation support of the proposed structure. This report presents a summary of pertinent project information, results of field testing, and our geotechnical engineering conclusions and recommendations. A Test Location Plan, CPT sounding logs, a Shear Wave Velocity plot, and laboratory results are included in the appendix.

S&ME appreciates the opportunity to provide our services on this project. Please contact us if you have any questions regarding this report or if we may be of further assistance.

Sincerely,

S&ME, Inc.

J. Adam Browning, P.E.
Jun 18 2021 9:58 AM

DocuSign

Alyson K. Aarons, P.E.
Project Engineer

J. Adam Browning, P.E.
Area Manger/Senior Geotechnical Engineer
NC Registration No. 034984

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Appendix I – Figures
Appendix II – CPT Sounding Logs and Shear Wave Velocity Plots
Appendix III – Laboratory Results

1.0 Project and Site Information

We understand the Town of Laurinburg plans to construct a fire station along the east side of Aberdeen Road, within the Laurinburg Scotland Industrial Park. The proposed location for the new fire station is the northwest corner of a 69-acre parcel, identified by Scotland County GIS PIN 02030501036. Based on the architectural site plan, the building will have a plan footprint of approximately 12,500 square feet with associated parking and drive lanes. The concept plan shows a storm pond on the south side of the building.

Structural loading information was not provided at the time of this report; however, we anticipate maximum column, wall, and floor loads will be on the order of 200 kips, 3 kips/ft, and 300 pounds per square foot, respectively.

We anticipate pavements will consist of a combination of concrete and asphalt pavement suitable for emergency vehicle traffic.

A site grading plan was not provided at the time of this report. Based on Google Earth topographic data, existing site elevations range from about 234 to 236 feet. We understand there is consideration for raising site grades by approximately 2 to 3 feet.

2.0 Methods of Exploration

Our exploration included a site reconnaissance by a geotechnical professional which included shallow hand auger borings to measure topsoil depths within the planned development area. After site reconnaissance, our exploration continued with the performance of six (6) cone penetrometer test (CPT) soundings (B-1, B-2, and P-1 through P-4) including one (1) seismic cone penetrometer test (SCPT) sounding (B-2). Within the building footprint, the soundings went to depths of 25 and 50 feet, and within pavement areas, soundings went to depths of 10 feet. One bulk sample of near-surface soils was collected near sounding location P-2 for laboratory testing. Sounding locations were selected and established in the field by S&ME by using a hand-held GPS device. Approximate test locations are shown on Figure 2 in the Appendix.

2.1 Cone Penetration Test Soundings

S&ME advanced the soundings as approximately shown on the Field Test Location Plan (Figure 2) in the Appendix. In a CPT sounding (ASTM D5778), an electronically instrumented cone penetrometer is hydraulically pushed through the soil to measure point stress, pore water pressure, and sleeve friction. The CPT data is used to determine soil stratigraphy and to estimate soil parameters such as, friction angle, and undrained shear strength. Soil types presented on CPT sounding logs are derived from Robertson's (1990) Soil Behavior Type (SBT) Index. The soil type determined from the SBT index is more representative of soil behavior characteristics than traditional soil classification that is based on grain size and plasticity. Sounding logs are included in the Appendix.

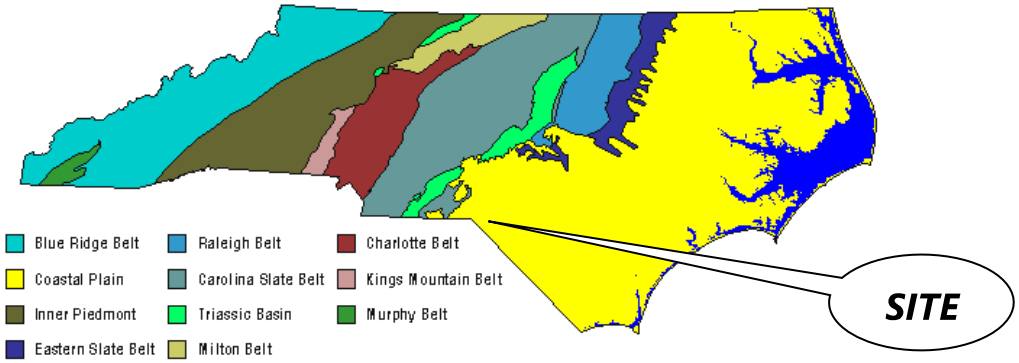
In a SCPT sounding the travel times of shear waves generated by an impulsive force applied to the ground surface are measured by geophones mounted within the cone penetrometer. For each measurement, the distance traveled and travel time of the first shear wave arrival was determined. Interval velocities were calculated by

dividing the distance between adjacent depths by the difference in travel times. Measurements are collected every 3 feet.

3.0 Surface and Subsurface Conditions

3.1 Physiography

Figure 1 - Physiography



The site is located within the Coastal Plain Physiographic Province of North Carolina as shown in Figure 1. The Coastal Plain Province is typically characterized by marine, alluvial, and aeolian sediments that were deposited during periods of fluctuating sea levels and moving shorelines. The soils and basal formations in the North Carolina Coastal Plain Physiographic Province are typical of those laid down in a shallow sloping sea bottom; interbedded sands and clays with irregular deposits of shells and layers of limestone and cemented sands. Alluvial sands, silts, and clays are typically present near rivers and creeks.

The site more specifically lies within the Middendorf formation. Middendorf deposits of the Cretaceous Age were laid down in a fluvial, deltaic environment close to shore, which gradually became a shallow basin under near shore conditions eastward. The source for the sediments was the westward lying, nearby Carolina Slate Belt and Triassic Basin. The complexity of the sediments was developed by a regular depositional cycle brought about by climatic changes. That is, the depositing streams would bring in sediments ranging in size from clay to gravel during flood stage, which results in varying consistencies throughout the area. The beds are laterally discontinuous with cross bedding common.

3.2 Subsurface Conditions

Details of the subsurface conditions encountered by the soundings are shown on the logs in the Appendix. These logs represent our interpretation of the subsurface conditions based upon field data. Stratification lines on the

logs represent approximate boundaries between soil types[1]; however, the actual transition may be gradual. The general subsurface conditions and their pertinent characteristics are discussed in the following paragraphs.

The exploration initially encountered 6 to 8 inches of organic laden topsoil underlain by very loose to loose clayey sand and soft to firm sandy clay in the upper 4 to 8 feet below the existing ground surface. Below the loose and soft surface soils, sounding B-1 encountered medium dense to dense clean to silty sand to a depth of 13 feet. Sounding B-2 encountered sands to a depth of 10 feet underlain by a 6-foot soft clay layer before returning to very dense sand to a depth of approximately 21 feet. Intermittent stiff clay layers and dense to very dense sand layers were encountered to a depth of 40 feet, underlain by very stiff silt and clay until the termination of the deepest sounding at 50 feet below the existing ground surface.

Shear wave velocity measurements in sounding B-2 ranged from approximately 500 to 820 feet per second.

In the CPT soundings, water was encountered at a depth of approximately 5 feet below the existing ground surface after completion of the sounding. Water levels tend to fluctuate with seasonal and climatic variations. Therefore, groundwater may be encountered during construction at depths not indicated by the soundings. In addition, perched water could be present within sands overlying less permeable soils between our test locations.

4.0 Laboratory Test Results

A summary of laboratory test results is presented in the following table. Individual laboratory test results are included in Appendix III.

Boring No.	Sample Depth (ft)	Natural Moisture Content (%)	Percent Passing No. 200 Sieve (%)	Atterberg Limits		Standard Proctor		CBR[1] (%)	USCS
				Liquid Limit	Plasticity Index	Opt. Moisture Content (%)	Max. Dry Unit Weight (pcf)		
P-2*	0 – 5	15.8	47.6	33	17	13.7	118.0	27.2	SC

[1] Corrected CBR value at 0.1 inches of penetration. The sample was compacted to approximately 98% of its standard Proctor maximum dry density, near its optimum moisture content. The sample was soaked for approximately 96 hours under a surcharge of approximately 100 pounds per square foot. Percent Swell of 1.0%.
** Bulk Sample*

5.0 Conclusions and Recommendations

The following conclusions and recommendations are based on our field exploration, our understanding of the proposed construction, our engineering analyses, experience with similar projects and subsurface conditions, and

[1] Soil Behavior Type is calculated based on empirical correlations with tip resistance, sleeve friction, and pore pressure. A CPT may define a soil based on its behavior as one type while its grain size and plasticity, the traditional basis for soil classification (USCS), may define it as a different type.

our correspondence with you. If structural loads and/or proposed site grades are different from those assumed or indicated, we should be provided the opportunity to review and comment upon the recommendations of this report so that they may be confirmed, extended, or modified as necessary. If subsurface conditions adverse to those indicated by this report are encountered during construction, those differences should be reported to us for review and comment.

5.1 General Discussion

Based on our review of the provided project information and geotechnical analyses of field-testing data, this site is suitable for the planned construction provided that site preparation recommendations presented herein are implemented during construction.

The following sections present our geotechnical conclusions and recommendations regarding site development.

5.2 Earthwork

5.2.1 Site Preparation

Initial site preparation should begin by clearing vegetation and stripping of organics and topsoil, and any other deleterious materials for a lateral distance of at least 5 feet beyond the limits of new construction. We anticipate topsoil thicknesses will typically range from 6 to 8 inches based on conditions encountered in the shallow hand auger borings during site reconnaissance. We recommend the site be stripped with light, tracked equipment to avoid mixing the topsoil into the low-consistency near surface soils and creating thicker stripping depths. Any voids created from stripping should be cleaned and filled with well-compacted structural fill.

After the required initial site work has been completed, we recommend that the exposed subgrade soils be proofrolled with a 10-ton smooth-drum self-propelled roller operating in the static mode or a loaded dump truck to locate any areas of soft, very loose, or otherwise unsuitable surface conditions. Any area that ruts or pumps should be disced, moisture conditioned to near the soil's optimum moisture content by drying or wetting, and recompacted. If recompaction is unsuccessful, undercutting and replacement may be required. The CPT soundings indicate loose near surface soils that may require repair at time of construction.

5.2.2 Excavations

Based on subsurface conditions encountered and assumed site grading, low to moderate consistency soils will be encountered within anticipated excavation depths at the site. Past experience indicates that these materials can be excavated by routine earth moving equipment. Local excavations for shallow utility trenches and foundations can be accomplished by a conventional backhoe or track-mounted backhoe.

Groundwater was encountered at an approximate depth of 5 feet within the CPT soundings at time of exploration. However, groundwater may be shallower at different times of year or in unexplored areas. If shallow water is encountered during construction the contractor should be prepared to dewater where utility or foundation excavations are required that go below the groundwater table and control any water that collects in excavations. The contractor should be responsible for determining water control measures. If subsurface water is encountered

during excavation, the water level should be maintained at least 2 feet below excavations to help maintain bottom stability.

Excavations should be sloped or shored in accordance with local, state and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor is usually responsible for site safety. This information is provided only as a service and under no circumstances should we be assumed responsible for construction site safety.

5.2.3 *Structural Fill*

We recommend that soils used as structural fill meet the following requirements:

- Contain less than 5 percent organics.
- Be free of debris or other deleterious materials.
- Have a maximum particle size of 2 inches or less.
- Have a minimum standard Proctor maximum dry density of 100 pounds per cubic foot.
- Have a plasticity index of less than 25 percent.

Based on the near-surface soils encountered in the CPT soundings, a portion of the on-site soils should be suitable for use as structural fill and backfill. On-site clays (CL, CH) will likely be difficult to grade with, especially during wet conditions. On-site sands (SP, SC, SM) such as those encountered in the bulk sample tested, should be suitable for use as structural fill. If off-site borrow is required, we recommend that the borrow meet the requirements presented above and be a sand material with less than 25 percent fines (silt/clay).

If groundwater is encountered during construction excavation, soils excavated below the groundwater level will require discing and drying prior to reuse as compacted structural fill.

5.2.4 *Fill Placement and Compaction*

All new structural fill soil should be placed in 8 to 10-inch loose lifts and compacted to at least 95 percent of the standard Proctor maximum dry density (MDD) (ASTM D 698). The top 12 inches should be compacted to at least 98 percent of the materials standard Proctor MDD. The moisture content of structural fill should be maintained at +/- 3 percent of optimum moisture content during compaction. A qualified S&ME soil technician working under the supervision of the geotechnical engineer should observe fill placement and compaction. An appropriate number of soil density tests should be conducted to confirm that adequate fill compaction is achieved.

5.3 Foundation Recommendations

We were provided maximum column, wall and floor loads of 200 kips, 3 kips per linear foot, and 300 pounds per square foot, respectively. Please let us know if assumed structural loads are different than our assumptions.

For column loads of up to 125 kips, foundations can be supported on shallow spread footings designed for a net allowable bearing pressure of 2,000 psf. This bearing pressure assumes that footings will bear in compacted structural fill or natural soils, and that the site is prepared as recommended above. For column loads higher than 125 kips up to 300 kips, shallow spread footings will require a neatline overexcavation and replacement with No.

57 stone to a depth of 2 feet below the footing bottom to achieve the net allowable bearing pressure of 2,000 psf. No design overexcavation is required for wall loads of 3 kips per linear foot or less (may be required for bearing capacity based on foundation subgrade conditions encountered at time of construction).

Footings should bear at least 18 inches below exterior grade to avoid frost penetration and develop the design bearing capacity. Continuous wall footings should be at least 18 inches wide, and isolated column footing should be at least 24 inches wide. This recommendation is made to prevent a localized or "punching" shear failure condition which can occur with very narrow footings.

Based on encountered subsurface conditions and assumed structural loads, we estimate that total settlement of building foundations will be 1 inch or less. These estimates assume that all structural fill is properly placed and compacted and overexcavation and replacement is performed as described above. A detailed foundation layout with structural loads is required to estimate differential settlement; however, based on the maximum column load and subsurface conditions encountered, we would estimate differential settlements of one half of the total settlement between adjacent columns.

5.3.1 Footing Evaluations

The bottom of all footing excavations for the structure should be evaluated by the project geotechnical engineer or a S&ME soils technician working under the direction of the geotechnical engineer using a hand auger and dynamic cone penetrometer (DCP) to gauge the consistency of subgrade soils. It is anticipated that densification of all the footing excavations will be required during construction due to the loose sand conditions of the near surface soils. Footing subgrades that are unstable or require bearing repairs should be either densified, over-excavated and replaced with NCDOT #57 stone or lean concrete as recommended by the S&ME representative at the time of foundation excavation.

5.4 Floor Slabs

The ground floor slab may be constructed above suitable compacted fill or stable natural soils provided that the recommendations described above are implemented. The slab should be separated from footings to allow for relative displacement.

A properly prepared subgrade should be suitable for slab-on-grade support. We recommend a 6-inch thickness of compacted dense graded aggregate (NCDOT ABC gradation) beneath the slab to enhance uniform slab support. The slab subgrade should be evaluated for stability immediately prior to placement of concrete. Provided subgrade materials are stable under proofrolling and 6-inches of compacted ABC stone is placed on the subgrade soil below the slab, a modulus of subgrade reaction value (k-value) of 125 psi/inch may be used for slab-on-grade design.

Exposure to the environment and construction activities will weaken the floor slab subgrade soils. Therefore, we recommend that subgrade soils in slab areas be evaluated prior to placement of the select granular fill. If near surface deterioration of the soils has occurred, densification of existing soils, undercutting, or reworking of the fill may be necessary.

Based on the results of our exploration and the assumed finish floor elevation, the floor slab will not be below the exterior grade and will not be subjected to hydrostatic pressure from groundwater. However, water vapor transmission through the slab is still a design consideration. Evaluating the need for and design of a vapor retarder or vapor barrier for moisture control is outside our scope of services and should be determined by the project architect/structural engineer based on the planned floor coverings and the corresponding design constraints, as outlined in ACI 302.1R-04 Guide for Concrete Floor and Slab Construction. Further, health and environmental considerations with respect to any potentially harmful vapor transmission are also outside of our scope.

5.5 Seismic Design Considerations

5.5.1 General

There are no known, mapped faults in the area of the site. Five minor earthquakes with epicenters in the Wilmington area with magnitudes of 3.0 to 3.9 occurred between 1871 and 1968[2]. The historic earthquake event which influences the design seismicity of the site the most is the 1886 Charleston, South Carolina earthquake with a magnitude of approximately 7.3.

5.5.2 Seismic Site Class

Seismic site classification is based on the top 100 feet of a site's subsurface profile. Based on the Shear Wave velocity values in the Seismic CPT soundings recorded during the field exploration and S&ME's knowledge of the local geology, per Section 1613 of the *2018 North Carolina State Building Code* the site is considered as Seismic Site Class D.

5.6 Pavement Recommendations

Pavement design procedures are based on AASHTO "Guide for Design of Pavement Structures" (1993) and associated literature. At the time of this report, traffic loading information was not available. For the purpose of our analysis, we have considered the following traffic loading.

Vehicle Type	Volume & Frequency
Emergency Vehicles	30 per day
Trash and Service Trucks	2 per week
Automobiles	20 per day

The pavement analysis was based on an initial serviceability index of 4.2 (4.5 for concrete), a terminal serviceability index of 2.0, and a 20-year design life.

[2] Map of Earthquake Epicenters in North Carolina and Portions of Adjacent States (1698-2006), North Carolina Geologic Survey.

5.6.1 *Asphalt Pavement*

The laboratory testing indicates a CBR value of greater than 10 percent; however, based on our experience, pavement design is based on a CBR value of 8 percent assuming a majority of the pavement subgrades will likely consist of imported sandy structural fill. This CBR value is based on the subgrade soils consisting of sandy soils and the top 12 inches being uniformly compacted to at least 98 percent of the soil's standard Proctor MDD. For the light-duty pavement areas (i.e. parking stalls) an 18-kip equivalent single axle loads (ESAL) value of 30,000 was used. For heavy-duty pavement area (i.e. access drives and route to vehicular bay and dumpster pad) an ESAL value of 500,000 was used. The thickness of the pavement is directly dependent on this assumption and should be reviewed by the owner and project designer.

Recommendations for the standard and heavy-duty asphalt pavements are provided in the table below.

Material Type	Light Duty	Heavy Duty
Asphalt Surface Course	2.0 inches (S-9.5B)	1.5 inches (S-9.5C)
Asphalt Intermediate Course	--	2.5 inches (I-19.0C)
Aggregate Base Course	6 inches	8 inches

All materials and construction methods should conform to the 2018 edition of the NCDOT "Standard Specifications for Roads and Structures." The aggregate base course (ABC) stone should consist of stone meeting the requirements under Section 520. ABC stone should be compacted to at least 98 percent of the maximum dry density as determined by the modified Proctor compaction test, AASHTO T-180M as modified by NCDOT. To confirm that the base course stone has been uniformly compacted, in place density tests should be performed by a qualified S&ME soils technician and the area should be thoroughly proofrolled under his observation.

Asphaltic concrete should conform to Section 610 in the 2018 edition of the NCDOT "Standard Specifications for Roads and Structures." Sufficient testing and observation should be performed during pavement construction to confirm that the required thickness, density, and quality requirements of the specifications are achieved.

Although our analysis was based on traffic loading for a 20-year design life, our experience indicates that pavement maintenance is necessary due to normal weathering of the asphaltic concrete. Normal weathering (i.e., oxidation) causes asphalt to become more brittle resulting in loss of tensional strength. This loss in strength can cause minor cracking which provides access for water infiltration into the stone base and subgrade. As the degree of saturation of the subgrade increases, the strength of the subgrade decreases leading to pavement failure. Routine maintenance in the form of sealing, patching, and maintaining proper drainage is required to increase pavement life. It is not uncommon for overlays to be required after 10 to 12 years.

5.6.2 *Concrete Pavement*

The concrete pavement design was performed using an assumed value for design traffic of 500,000 ESALs. The compressive strength of the concrete was assumed to be 4,000 psi. A modulus of subgrade reaction of 125 pci

was used for design assuming 6 inches of compacted ABC stone is placed beneath the concrete pavement. We have assumed that load transfer across contraction (saw) joints will be handled by aggregate interlock (i.e. load transfer dowels are not required). ABC should meet the material and compaction requirements stated in the "Flexible (Asphalt) Pavement" section above.

Concrete pavement is recommended for heavily loaded traffic and dumpster pad areas. The table below presents our recommended concrete pavement section thicknesses.

Material Type	Concrete Pavement Design
Air Entrained Concrete (4000 psi)	7.0 inches
Aggregate Base Course (ABC) stone	6.0 inches
Maximum Joint Spacing	15 feet in all directions

Saw joints should be cut to a depth of at least ¼ of the thickness of the concrete pavement to promote shrinkage cracking along the joint. The ABC stone should be compacted to at least 98 percent of its modified Proctor maximum dry density and be proofrolled with a loaded dump truck prior to concrete placement.

6.0 Qualifications of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other representation or warranty either express or implied, is made.

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

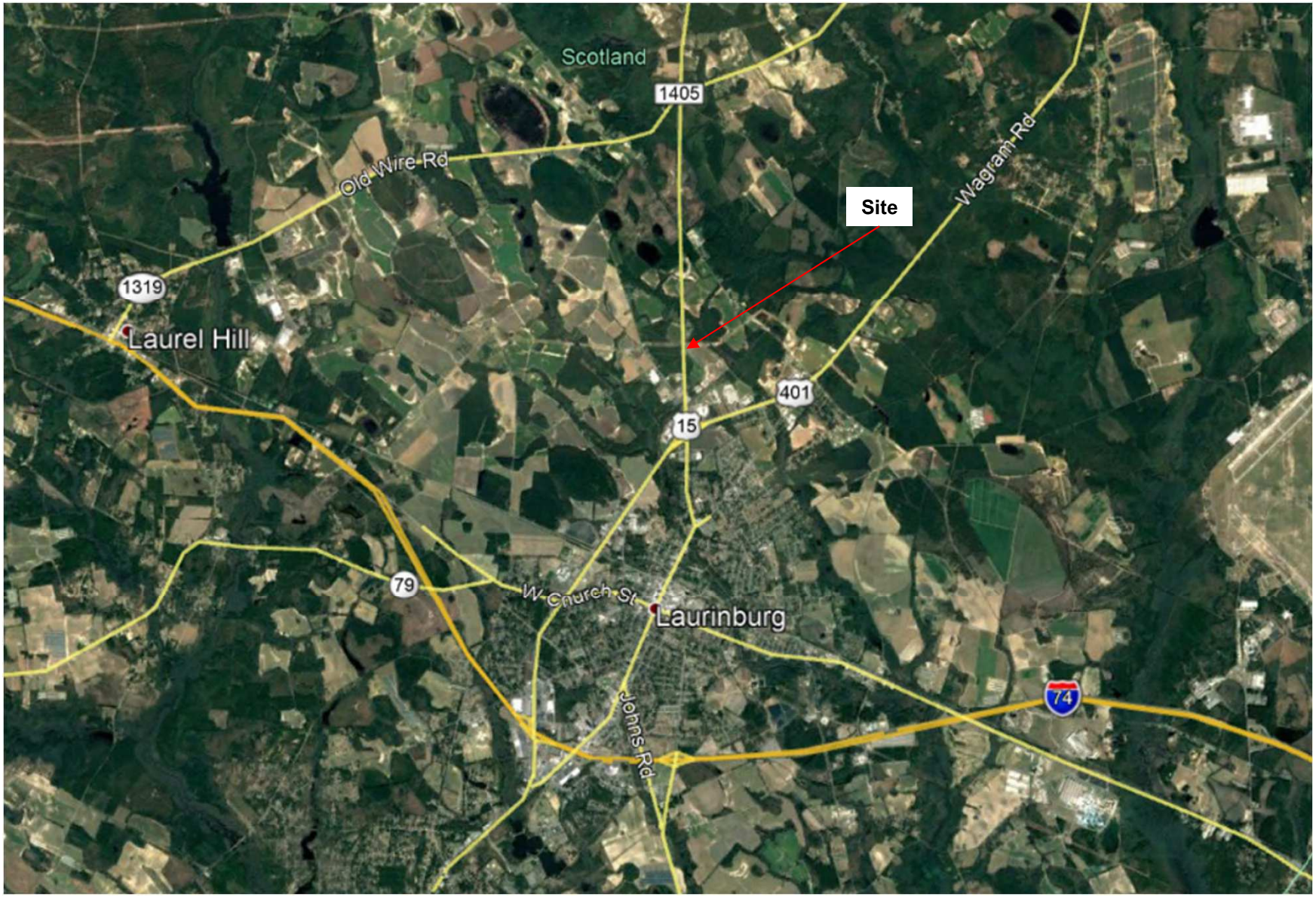
Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction activities.

Appendices

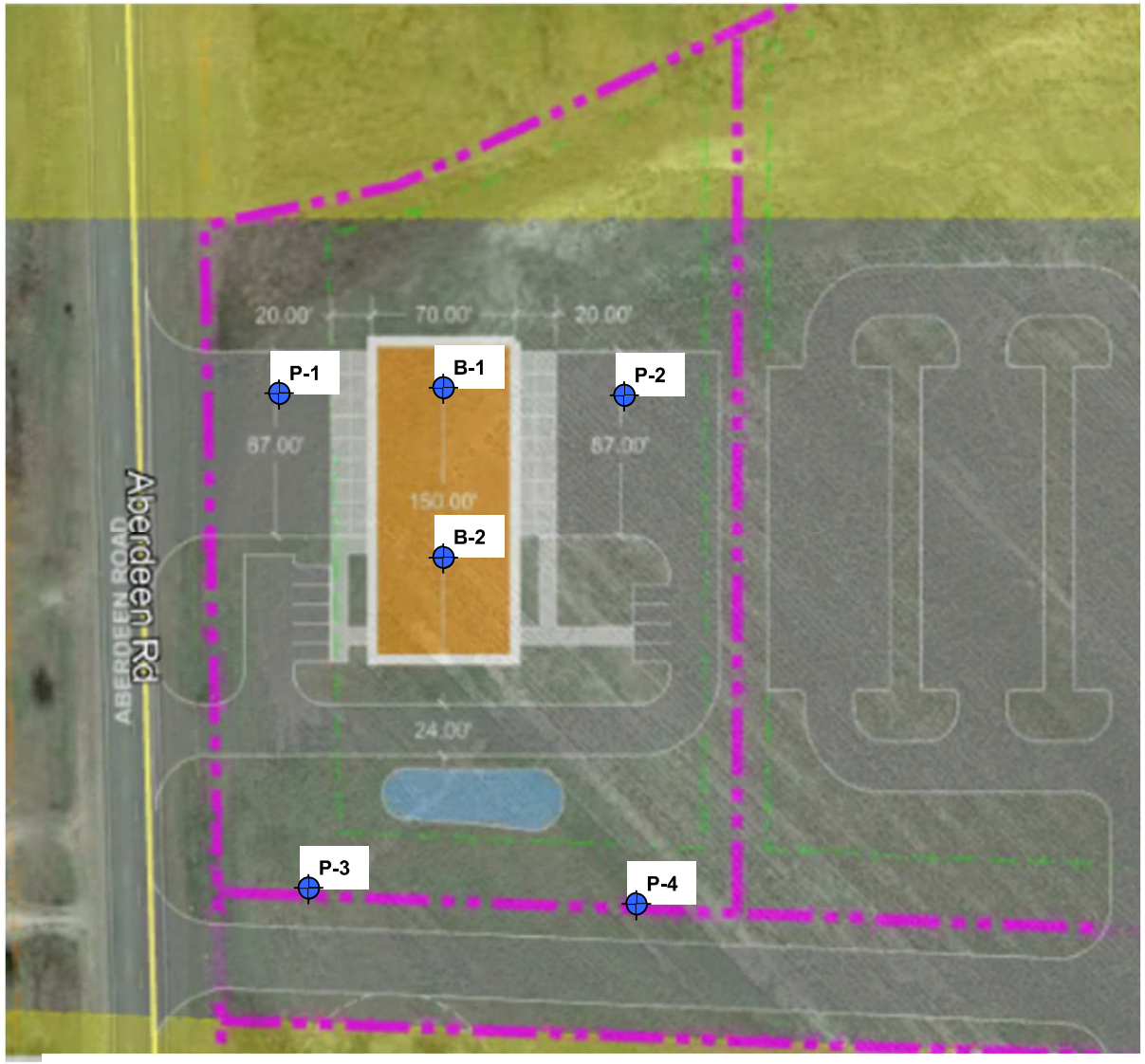
Appendix I – Figures



SITE VICINITY MAP

LAURINBURG FIRE STATION
ABERDEEN ROAD
LAURINBURG, NORTH CAROLINA

SCALE:	FIGURE NO.
NOT TO SCALE	1
DATE:	
6/11/2021	
PROJECT NUMBER	
4305-20-096 CO-1	



LEGEND

CPT Sounding Location

NOTE:
THE DRAWING PROVIDED BY THE CLIENT AND THE AERIAL PHOTOGRAPH FROM GOOGLE EARTH WAS MODIFIED BY S&ME. GRAPHIC IS FOR GENERAL INFORMATION ONLY AND SHOULD NOT BE USED FOR THE MEASUREMENT OR ESTIMATION OF QUANTITIES OR DISTANCES.

TEST LOCATION PLAN

LAURINBURG FIRE STATION
ABERDEEN ROAD
LAURINBURG, NORTH CAROLINA

SCALE:	FIGURE NO.
NOT TO SCALE	2
DATE: 6/11/2021	
PROJECT NUMBER 4305-20-096 CO-1	

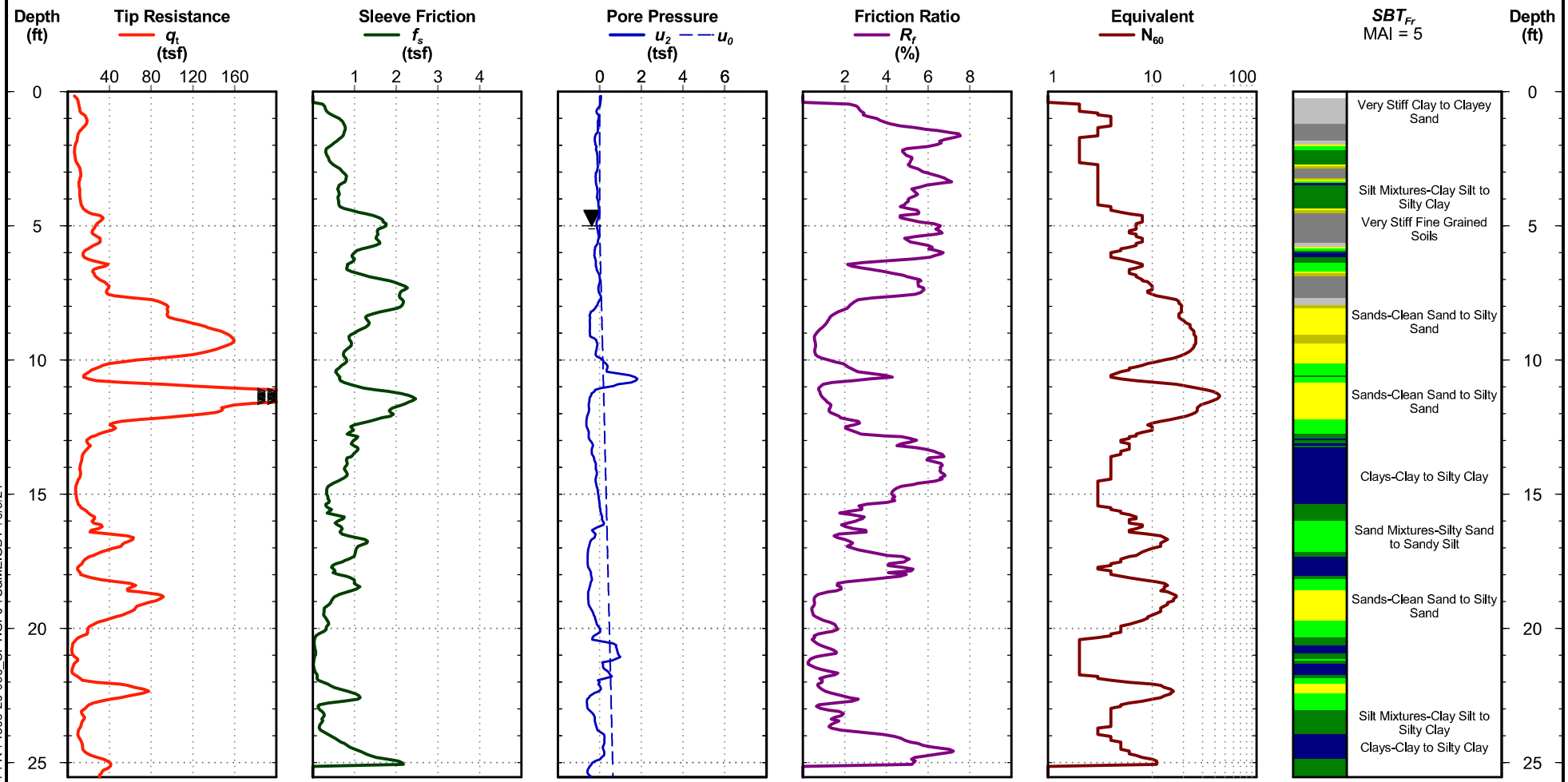
Appendix II – CPT Sounding Logs and Shear Wave Velocity Plots

Sounding ID: B-1

Laurinburg Fire Station
Laurinburg, North Carolina
S&ME Project No: 4305-20-096

Date: Jun. 8, 2021
Estimated Water Depth: 5 ft
Rig/Operator: ATV/T. Chew

Total Depth: 25.5 ft
Termination Criteria: Target Depth
Cone Size: 1.75



Cone Penetration Test

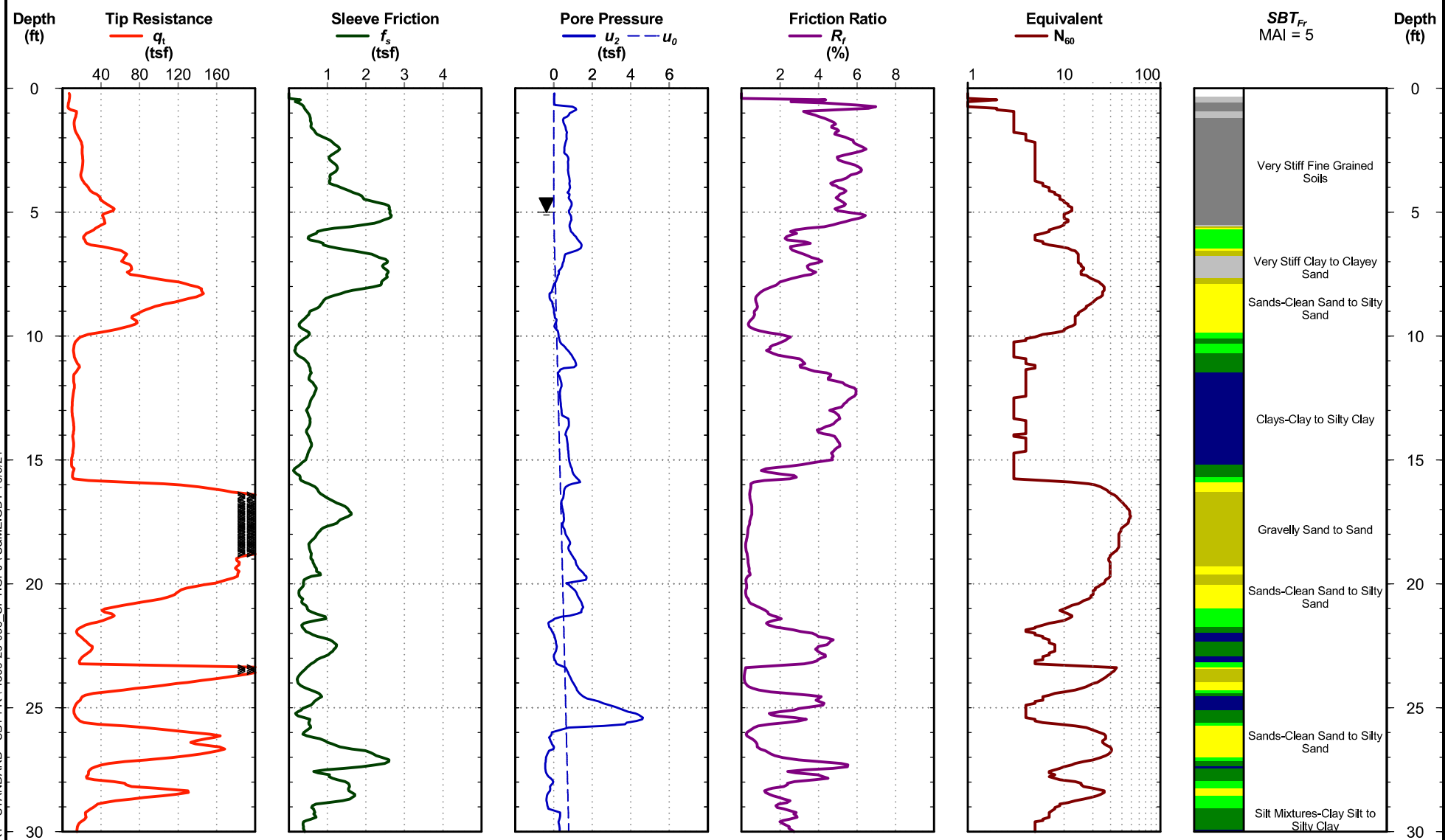
Electronic Filename: B-1.DAT

Sounding ID: B-2

Laurinburg Fire Station
Laurinburg, North Carolina
S&ME Project No: 4305-20-096

Date: Jun. 8, 2021
Estimated Water Depth: 5 ft
Rig/Operator: ATV/T. Chew

Total Depth: 50.1 ft
Termination Criteria: Target Depth
Cone Size: 1.75



Cone Penetration Test

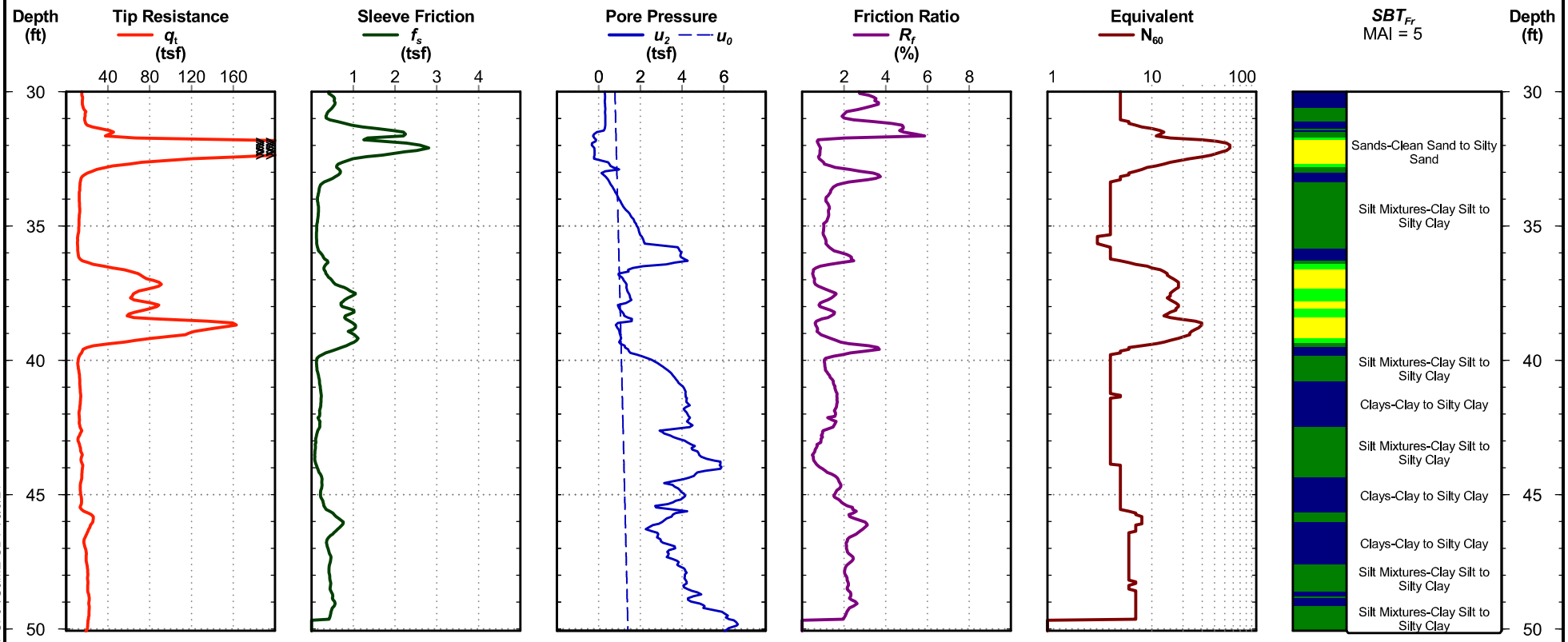
Electronic Filename: B-2.DAT

Sounding ID: B-2

Laurinburg Fire Station
Laurinburg, North Carolina
S&ME Project No: 4305-20-096

Date: Jun. 8, 2021
Estimated Water Depth: 5 ft
Rig/Operator: ATV/T. Chew

Total Depth: 50.1 ft
Termination Criteria: Target Depth
Cone Size: 1.75



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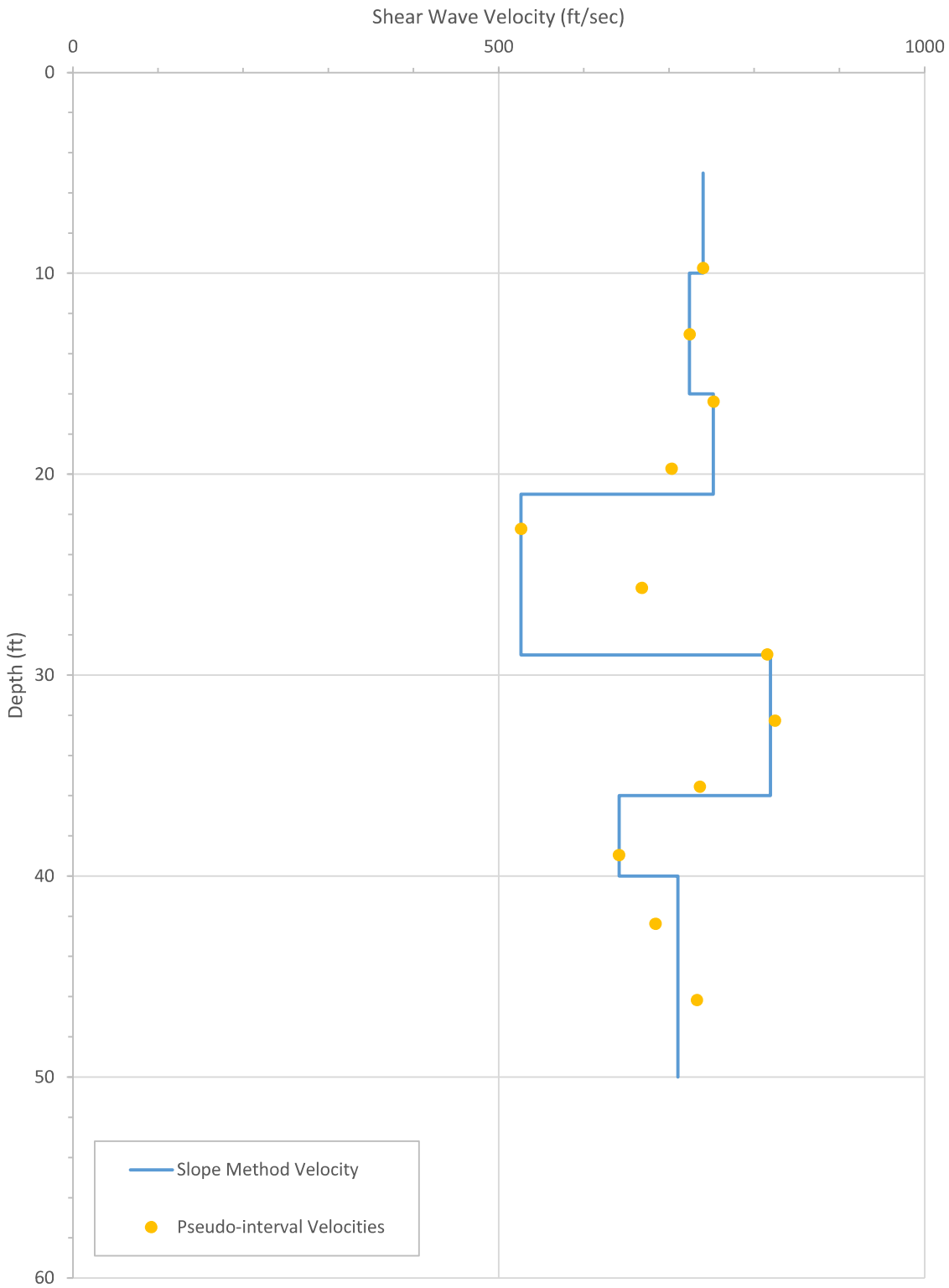


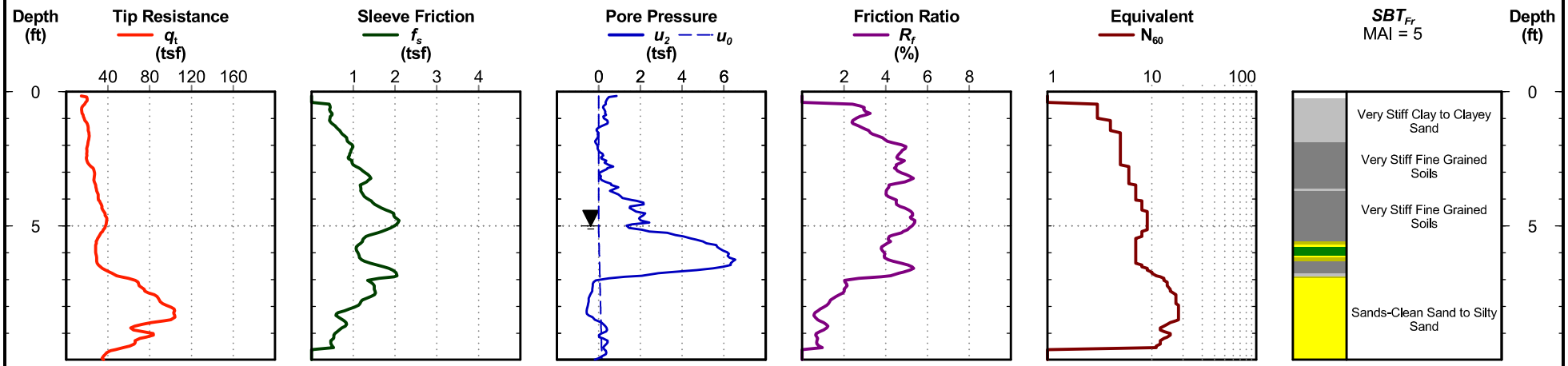
Drawn by: A. Aarons		**Shear Wave Velocity Profile**	Fig. No.
Checked by: A. Browning		Laurinburg Fire Station Laurinburg, NC	3
Date: 6/8/2021		Proj. No. 4305-20-096 B-2	

Sounding ID: P-1

Laurinburg Fire Station
Laurinburg, North Carolina
S&ME Project No: 4305-20-096

Date: Jun. 8, 2021
Estimated Water Depth: 5 ft
Rig/Operator: ATV/T. Chew

Total Depth: 10.0 ft
Termination Criteria: Target Depth
Cone Size: 1.75



Cone Penetration Test

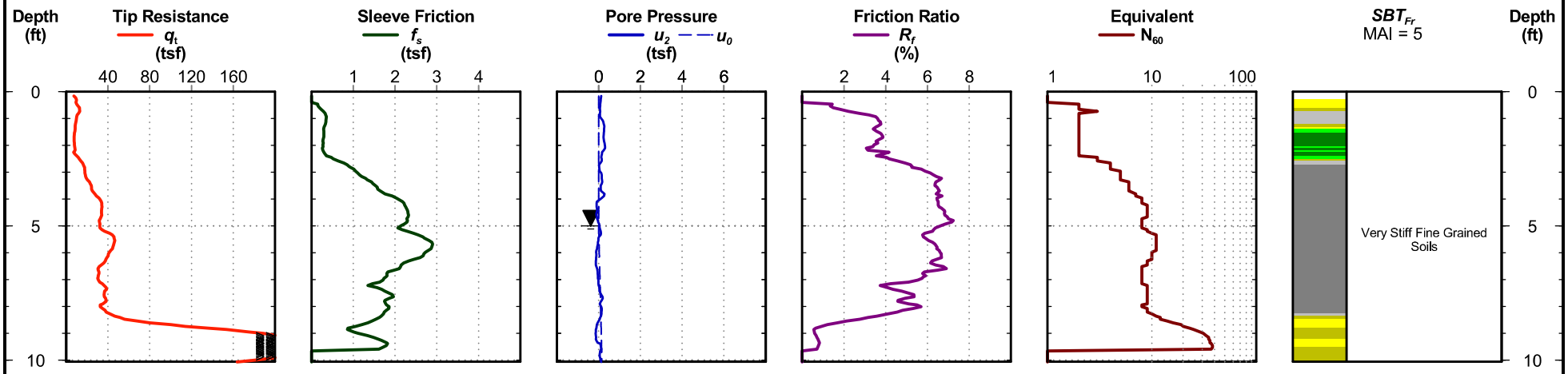
Electronic Filename: P-1.DAT

Sounding ID: P-2

Laurinburg Fire Station
Laurinburg, North Carolina
S&ME Project No: 4305-20-096

Date: Jun. 8, 2021
Estimated Water Depth: 5 ft
Rig/Operator: ATV/T. Chew

Total Depth: 10.1 ft
Termination Criteria: Target Depth
Cone Size: 1.75



Cone Penetration Test

Electronic Filename: P-2.DAT

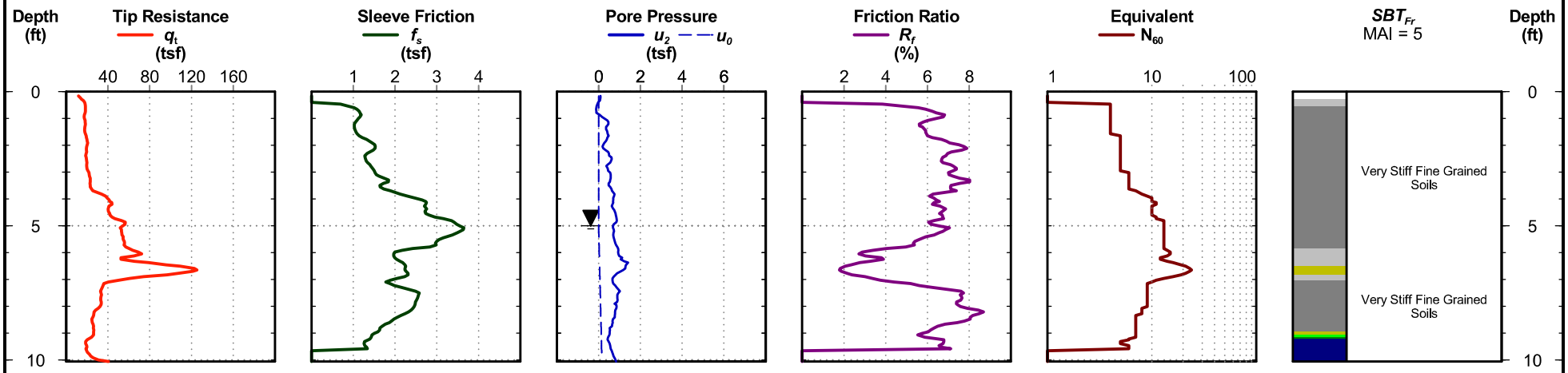
CPT REPORT - STANDARD - SBT FR \ 4305-20-096_CPT.GPJ \ S&ME.GDT \ 6/9/21

Sounding ID: P-3

Laurinburg Fire Station
Laurinburg, North Carolina
S&ME Project No: 4305-20-096

Date: Jun. 8, 2021
Estimated Water Depth: 5 ft
Rig/Operator: ATV/T. Chew

Total Depth: 10.1 ft
Termination Criteria: Target Depth
Cone Size: 1.75



Cone Penetration Test

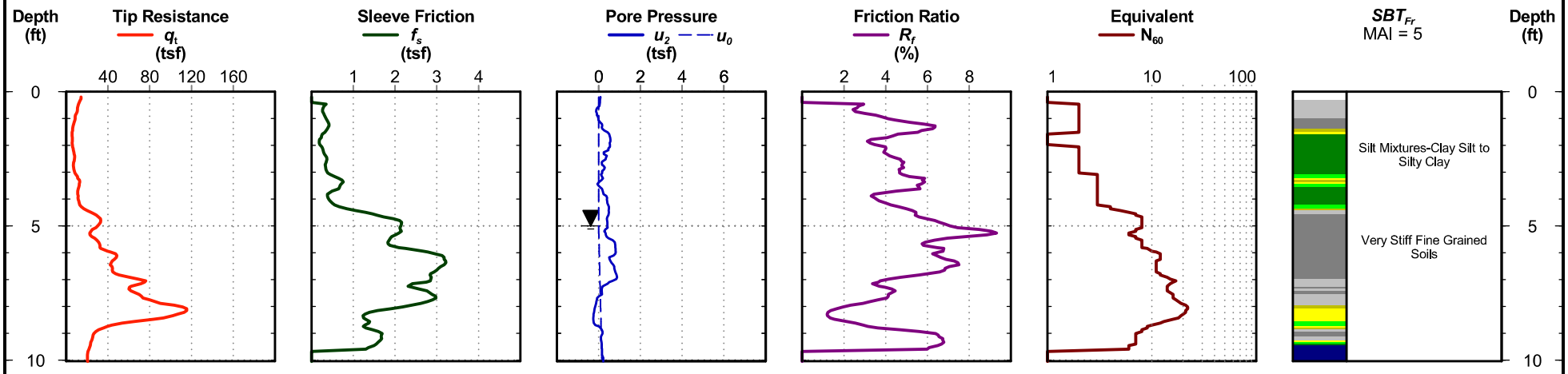
Electronic Filename: P-3.DAT

Sounding ID: P-4

Laurinburg Fire Station
Laurinburg, North Carolina
S&ME Project No: 4305-20-096

Date: Jun. 8, 2021
Estimated Water Depth: 5 ft
Rig/Operator: ATV/T. Chew

Total Depth: 10.0 ft
Termination Criteria: Target Depth
Cone Size: 1.75



Cone Penetration Test

Electronic Filename: P-4.DAT

FIELD TESTING PROCEDURES

Seismic Cone Penetrometer Test (SCPT) and Cone Penetrometer Test (CPT) Sounding

The cone and seismic cone penetrometer test soundings (ASTM D 5778) were performed by hydraulically pushing an electronically instrumented cone penetrometer through the soil at a constant rate. As the cone penetrometer tip was advanced through the soil, nearly continuous readings of point stress, sleeve friction and pore water pressure were recorded and stored in the on-site computers. Using theoretical and empirical relationships, CPT data can be used to determine soil stratigraphy and estimate soil properties and parameters such as effective stress, friction angle, Young's Modulus and undrained shear strength.

During the SCPT sounding, the cone penetrometer was halted at pre-specified depth increments to measure shear waves. As the probe was stopped, a shear wave was then generated at the ground surface. As the shear waves propagate through the soil, the response of geophones mounted inside the cone penetrometer is recorded with time to create a shear wave record. Several of these records were taken at different depth intervals in the sounding and arrival times for each record were compared to calculate the shear wave velocity of the soil for the given depth interval.

The consistency and relative density designations, which are based on the cone tip resistance, q_t for sands and cohesive soils (silts and clays) are as follows:

SANDS		SILTS AND CLAYS	
Cone Tip Resistance, q_t (tsf)	**Relative Density**	**Cone Tip Resistance, q_t (tsf)**	**Consistency**
<20	Very Loose	<5	Very Soft
20 – 40	Loose	5 – 10	Soft
40 – 120	Medium Dense	10 – 15	Firm
		15 – 30	Stiff
120 – 200	Dense	30 –60	Very Stiff
>200	Very Dense	>60	Hard

CPT Correlations

References are in parenthesis next to the appropriate equation.

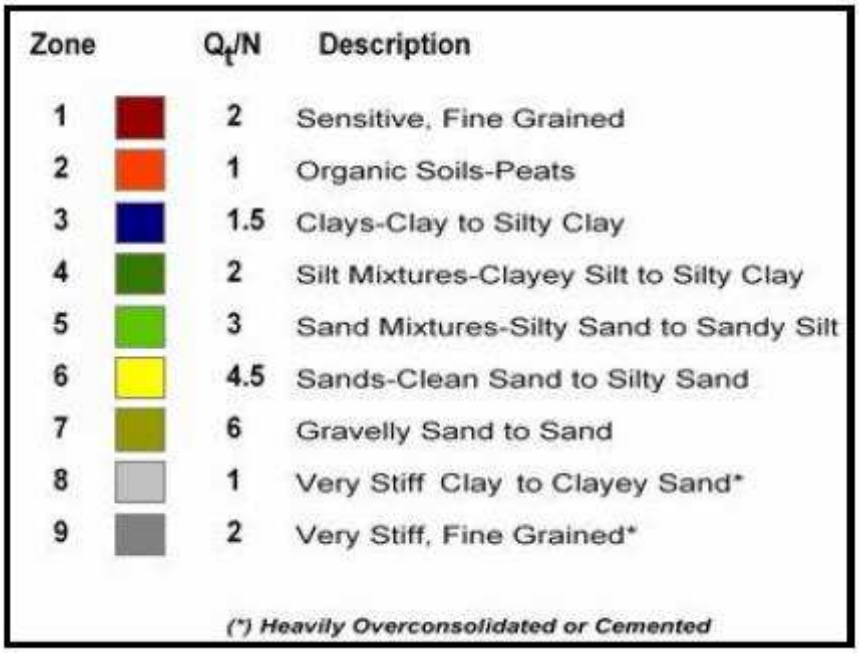
General

p_a = atmospheric pressure (for unit normalization)
q_t = corrected cone tip resistance (tsf)
f_s = friction sleeve resistance (tsf)
$R_f = 100\% * (f_s/q_t)$
u_2 = pore pressure behind cone tip (tsf)
u_0 = hydrostatic pressure
$B_q = (u_2-u_0)/(q_t-\sigma_{v0})$
$Q_t = (q_t-\sigma_{v0})/ \sigma'_{v0}$
$F_r = 100\% * fs/(q_t-\sigma_{v0})$
$I_c = ((3.47-\log Q_t)^2+(\log F_r+1.22)^2)^{0.5}$

N-Value
$N_{60} = (q_t/p_a)/[8.5(1-I_c/4.6)]$ (6)

(6) Jefferies, M.G. and Davies, M.P., (1993), "Use of CPTu to estimate equivalent SPT N60", ASTM Geotechnical Testing Journal, Vol. 16, No. 4

CPT Soil Classification Legend



Robertson's Soil Behavior Type (SBT), 1990			
Group #	Description	I_c	
		Min	Max
1	Sensitive, fine grained	N/A	
2	Organic soils - peats	3.60	N/A
3	Clays - silty clay to clay	2.95	3.60
4	Silt mixtures - clayey silt to silty clay	2.60	2.95
5	Sand mixtures - silty sand to sandy silt	2.05	2.60
6	Sands - clean sand to silty sand	1.31	2.05
7	Gravelly sand to dense sand	N/A	1.31
8	Very stiff sand to clayey sand (High OCR or cemented)	N/A	
9	Very stiff, fine grained (High OCR or cemented)	N/A	

Soil behavior type is based on empirical data and may not be representative of soil classification based on plasticity and grain size distribution.

Appendix III – Laboratory Results

Form No: TR-D2216-T265-2
Revision No. 1
Revision Date: 08/16/17

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☑ *AASHTO T 265* ☐

S&ME, Inc. Raleigh: 3201 Spring Forest Road, Raleigh, NC 27616

Project #:	4305-20-096 Ph. 110	Report Date:	6/11/2021
Project Name:	North Fire Station - Laurinburg, NC	Test Date(s)	6/10 - 6/11/2021
Client Name:	City of Laurinburg		
Client Address:			
Sample by:	S&ME	Sample Date(s):	6/8/21
Sampling Method:	Bulk	Drill Rig :	0-5 ft.

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 20977 Calibration Date: 4/5/2021 Oven ID. 1454 Calibration Date: 11/29/2019

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
P-2	Bulk	0-5		8.97	276.54	240.09	36.45	15.8%

Notes / Deviations / References

AASHTO T 265: Laboratory Determination of Moisture Content of Soils

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

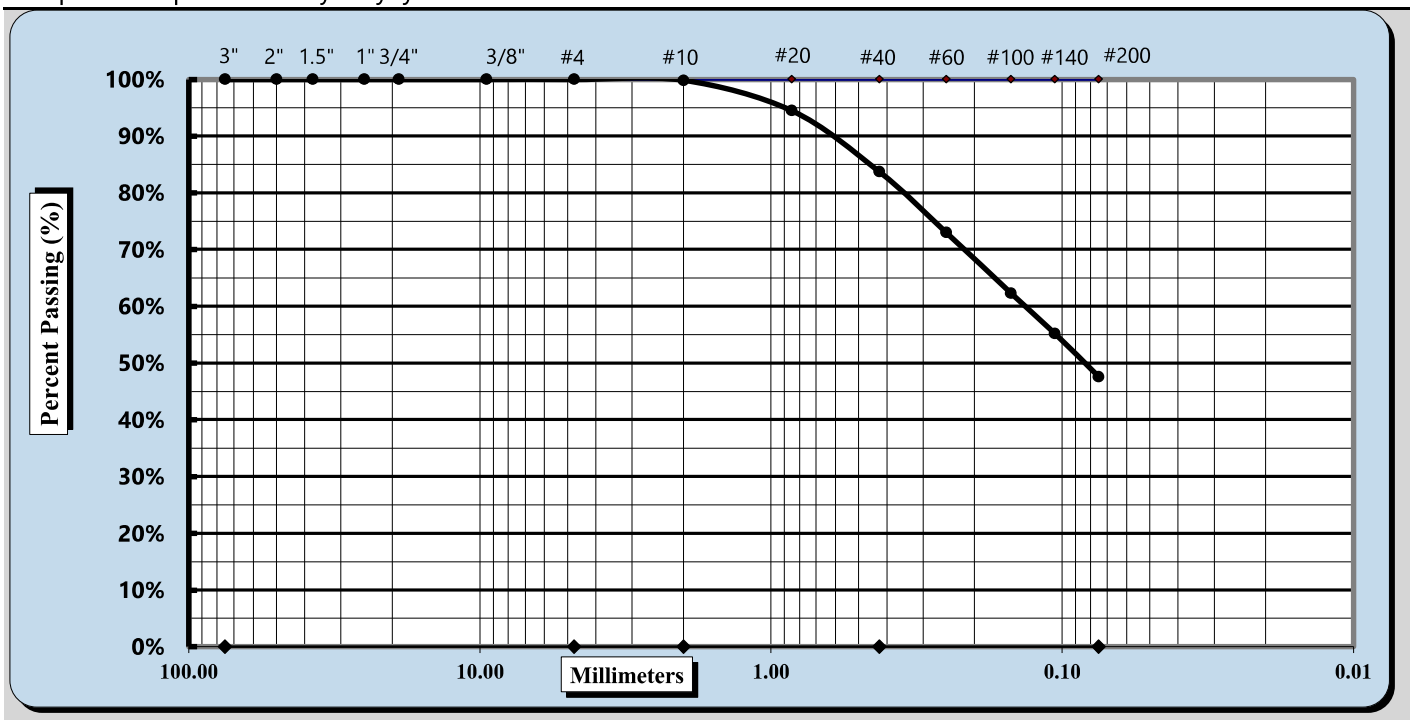
Mal Krajan, ET		Laboratory Manager	6/11/2021
Technical Responsibility	*Signature*	*Position*	*Date*

SIEVE ANALYSIS OF SOIL

Single sieve set ASTM D6913

S&ME, Inc. Raleigh: 3201 Spring Forest Road, Raleigh, NC 27616

Project #:	4305-20-096 Ph. 110	Record Date:	6/9/2021
Project Name:	North Fire Station - Laurinburg, NC	Lab Report #:	1
Client Name:	City of Laurinburg	Date Received:	6/8/2021
Received By:	Lab Tech	Sampled by: S&ME, Inc.	Date Sampled: 6/8/2021
Location:	Site-Borehole	Boring #: P-2	Sample #: Bulk
Log/Sample Id.	164	Type: Bulk	Elev/Depth (ft): 0-5
Sample Description:	Gray Clayey SAND		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Method: B Procedure for obtaining Specimen: Moist

Maximum Particle Size	#4	Coarse Sand	0.2%	Fine Sand	36.1%
Gravel	0.0%	Medium Sand	16.1%	Silt & Clay	47.6%
Liquid Limit	33	Plastic Limit	16	Plastic Index	17
Maximum Dry Density	118.0 pcf	Bulk Gravity (C127)	N/A	% Absorption	N/A
Optimum Moisture	13.7%	Natural Moisture	15.8%		

Notes / Deviations / References:

Mal Krajan, ET		Laboratory Manager	6/17/2021
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-D4318-T89-90
Revision No.
Revision Date: 8/28/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

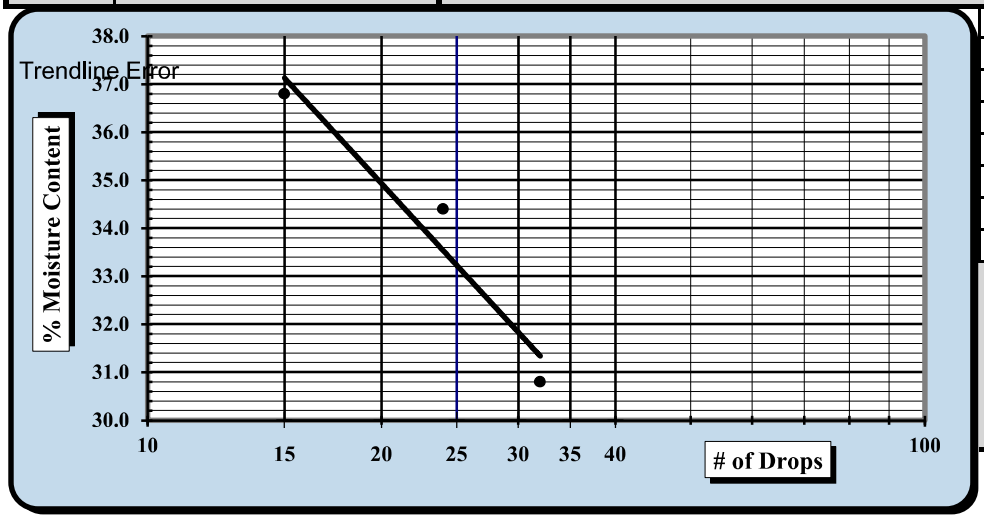
S&ME, Inc. Raleigh: 3201 Spring Forest Road, Raleigh, NC 27616

Project #:	4305-20-096 Ph. 110	Report Date:	6/17/2021
Project Name:	North Fire Station - Laurinburg, NC	Test Date(s)	6/10 - 6/15/2021
Client Name:	City of Laurinburg		
Client Address:			

Boring #:	P-2	Sample #: Bulk		Sample Date: 6/8/2021	
Location:	Site-Borehole	Offset: N/A		Depth (ft): 0-5	
Sample Description:	Gray Clayey SAND				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	20977	4/5/2021	Grooving tool	1801	5/21/2021
LL Apparatus	1803	8/2/2020			
Oven	1454	11/29/2020			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:									
A	Tare Weight	20.99	20.92	13.60				13.31	20.98	
B	Wet Soil Weight + A	34.89	33.84	30.03				23.99	33.10	
C	Dry Soil Weight + A	31.62	30.53	25.61				22.55	31.45	
D	Water Weight (B-C)	3.27	3.31	4.42				1.44	1.65	
E	Dry Soil Weight (C-A)	10.63	9.61	12.01				9.24	10.47	
F	% Moisture (D/E)*100	30.8%	34.4%	36.8%				15.6%	15.8%	
N	# OF DROPS	32	24	15				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**15.7%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**33**
Plastic Limit	**16**
Plastic Index	**17**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☐ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* 16.3%

Notes / Deviations / References: Group symbol based on percent of sample passing #40 sieve.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Mal Krajan, ET		Laboratory Manager	6/17/2021
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-D698-2
Revision No. : 1
Revision Date: 07/25/17

MOISTURE - DENSITY REPORT

Quality Assurance

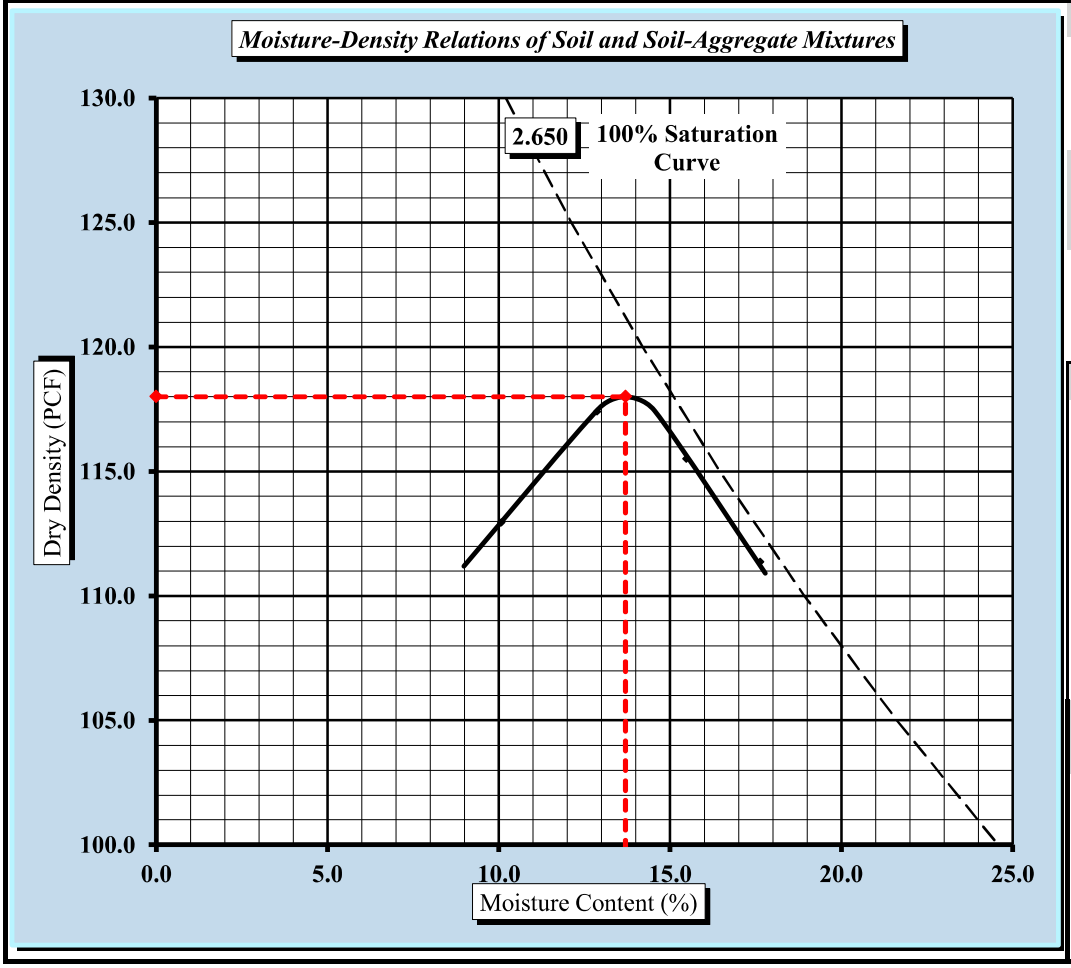
S&ME, Inc. Raleigh: 3201 Spring Forest Road, Raleigh, NC 27616

S&ME Project #:	4305-20-096 Ph. 110	Report Date:	6/11/2021
Project Name:	North Fire Station - Laurinburg, NC	Test Date(s):	6/09 - 6/11/2021
Client Name:	City of Laurinburg		
Client Address:			

Boring #:	P-2	Sample #:	Bulk	Sample Date:	6/8/2021
Location:	Site-Borehole	Offset:	N/A	Depth (ft):	0-5 ft.
Sample Description:	Gray Clayey SAND				

Maximum Dry Density 118.0 PCF. Optimum Moisture Content 13.7%

ASTM D 698 - - Method A



Soil Properties	
Natural Moisture Content	15.8%
Assumed Specific Gravity	2.650
Liquid Limit	33
Plastic Limit	16
Plastic Index	17

% Passing	
3/4"	100.0%
3/8"	100.0%
#4	100.0%
#10	99.8%
#40	83.7%
#60	73.0%
#200	47.6%

Oversize Fraction	
Bulk Gravity	
% Moisture	
% Oversize	
MDD	
Opt. MC	

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐

Mechanical Rammer ☐ Manual Rammer ☒ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations:

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Mal Krajan, ET		Laboratory Manager	6/11/2021
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-D1883-T193-3
Revision No. 2
Revision Date: 08/11/17

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

ASTM D 1883

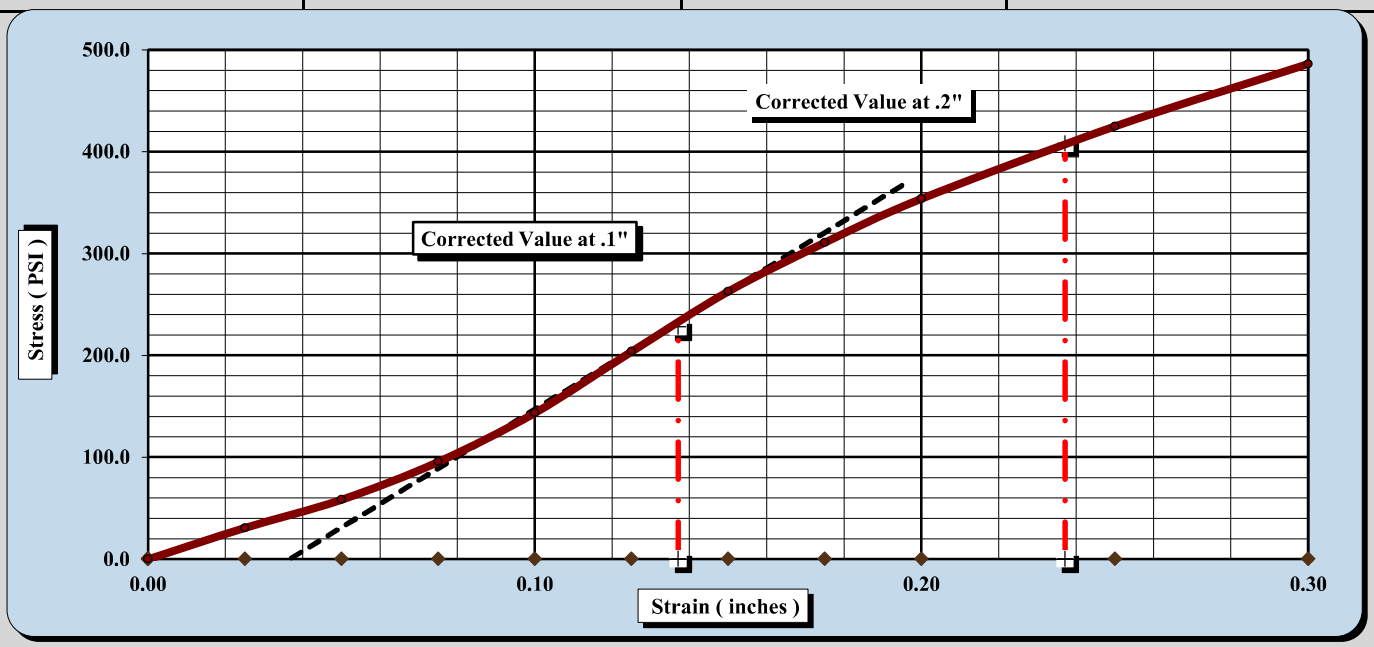
S&ME, Inc. Raleigh: 3201 Spring Forest Road, Raleigh, NC 27616

Project #:	4305-20-096 PH 110	Report Date:	6/17/2021
Project Name:	North Fire Station - Laurinburg, NC	Test Date(s)	6/11 - 6/17/2021
Client Name:	City of Laurinburg		
Client Address:			
Boring #:	P-2	Sample #: Bulk	Sample Date:
Location:	Site-Borehole	Offset: N/A	Depth (ft): 0-5
Sample Description:	Gray Clayey SAND		

ASTM D 698 *Method A* Maximum Dry Density: 118.0 PCF Optimum Moisture Content: 13.7%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 14.4	CBR at 0.2 in. 23.6	CBR at 0.1 in. 22.8	CBR at 0.2 in. 27.2



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	42	Final Dry Density (PCF)	115.2
Initial Dry Density (PCF)	115.0	Average Final Moisture Content	13.8%
Moisture Content of the Compacted Specimen	13.2%	Moisture Content (top 1" after soaking)	14.5%
Percent Compaction	97.5%	Percent Swell	0.1%

Soak Time:	96 hrs.	Surcharge Weight	20.0	Surcharge Wt. per sq. Ft.	101.9
Liquid Limit	33	Plastic Index	17		

Notes/Deviations/References:

Test specimen compacted to 98% at optimum moisture.

Mal Krajan, ET		Laboratory Manager	6/17/2021
Technical Responsibility	*Signature*	*Position*	*Date*

June 4, 2021

City of Laurinburg
503 Hall Street
Laurinburg, North Carolina 28532

Attn: Mr. Harold W. Haywood, MPA, CLGPO
General Services Director
via email: hhaywood@laurinburg.org

Care of: John Crawford, Creech & Associates

Reference: **Stormwater Soil Evaluation Report**
Laurinburg Fire Department
Aberdeen Road, Laurinburg, Scotland County, North Carolina
S&ME Project No. 4305-20-096

Dear Mr. Haywood and Mr. Crawford:

S&ME, Inc. (S&ME) has conducted a stormwater soil evaluation in general accordance with S&ME Proposal 4305-20-096 CO-1 dated May 13, 2021. Our evaluation was conducted to provide information for the design of a Stormwater Control Measure (SCM) and a Stormwater Management Permit Application to the North Carolina Department of Environmental Quality (NCDEQ) – Division of Energy, Minerals, & Land Resources (DEMLR) and/or local municipality. A soil scientist evaluated the soil conditions within the proposed SCM location on May 31, 2021.

♦ Background Information

We understand the Town of Laurinburg plans to construct a fire station along the east side of Aberdeen Road, within the Laurinburg Scotland Industrial Park. The proposed location for the new fire station is the northwest corner of a 69-acre parcel, identified by Scotland County GIS PIN 02030501036. Based on the architectural site plan, the proposed building will have plan footprint of approximately 12,500 square feet, with associated parking and drive lanes. The concept plan shows a SCM on the south side of the building.

The site boundary, proposed SCM location and requested hand auger boring locations are depicted on the attached United States Department of Agriculture (USDA) Soil Conservation Service (SCS) Scotland County soil survey exhibit (**Figure 1**) and United States Geologic Service (USGS) topographic exhibit (**Figure 2**) respectively.

The soils on-site in the vicinity of the proposed SCM are mapped as the Coxville soil series. The Coxville series consists of poorly drained soils with moderately slow permeability with very shallow to shallow, common to persistent internal free water occurrence. These soils are located in the lower to upper coastal plain on flats, Carolina bays, and depressions. The depth to the SHWT is from 0 to 12 inches below the ground surface from November to April.

The soil evaluation was performed with hand auger borings conducted at two locations (SHWT-1 and SHWT-2) as shown on the attached Stormwater Soil Evaluation Exhibit (**Figure 3**). Our evaluation consisted of identifying and recording the soil morphological conditions at these locations in order to develop soil profile descriptions, perform SHWT estimations and measure the observed water table (OWT) if applicable.

♦ Findings

SHWT Estimation, OWT Measurement, and Depth to Auger Refusal

S&ME estimated the SHWT by advancing hand auger borings at the two locations as shown on the attached **Figure 3** and evaluating the soil for evidence of SHWT influence. This evaluation involved looking at the actual moisture content in the soil and observing the matrix and mottle colors. Depending on the soil texture, the soil color will indicate processes that are driven by SHWT fluctuations, such as iron reduction and oxidation and organic matter staining.

In addition, S&ME attempted to measure the OWT level below existing ground surface (EGS) at the indicated hand auger boring locations, however groundwater was not encountered. Auger refusal was encountered at shallow depths at both hand auger boring locations.

See **Table 1** below and **Figure 3** for the estimated depth to SHWT, measured depth to the OWT and auger refusal if applicable.

Table 1

HAND AUGER BORING LOCATION	SEASONAL HIGH WATER TABLE (SHWT) DEPTH (inches/feet below EGS)	OBSERVED WATER TABLE (OWT) DEPTH (inches/feet below EGS)	AUGER REFUSAL DEPTH (inches/feet below EGS)
SHWT-1	10 / 0.8	>48 / >4.0	>48 / >4.0
SHWT-2	8 / 0.7	>48 / >4.0	>48 / >4.0

EGS: Existing Ground Surface

Permeability/Hydraulic Conductivity Estimation

The soil profile descriptions on the attached **Figure 3** show the soil morphological conditions including soil texture, structure, soil matrix and mottle color, estimated United States Department of Agriculture (USDA) permeability and estimated USDA hydraulic conductivity (Ksat) for the different soil horizons found on-site.

Please refer to the enclosed map and soil profile descriptions for more information. These estimates were obtained from one or more of the following: Scotland County Soil Survey "Physical & Chemical Properties of the Soil - Permeability"; and/or USDA-NRCS (United States Department of Agriculture - Natural Resource Conservation Service) official series description, and/or "NRCS Field Book for Describing & Sampling Soils". The permeability estimates were converted to conductivity on the profile description tables.

♦ Limitations

Data and conclusions presented herein are based on materials encountered at the hand auger boring locations only. Conditions may vary between hand auger boring locations and in other areas of the proposed SCMs. The reported depths are based upon the ground surface locations of the borings at the time of our evaluation.

♦ Closing

S&ME appreciates the opportunity to provide soil evaluation services for this project. If you have any questions please contact Walter Cole at 919-872-2660 or wcole@smeinc.com.

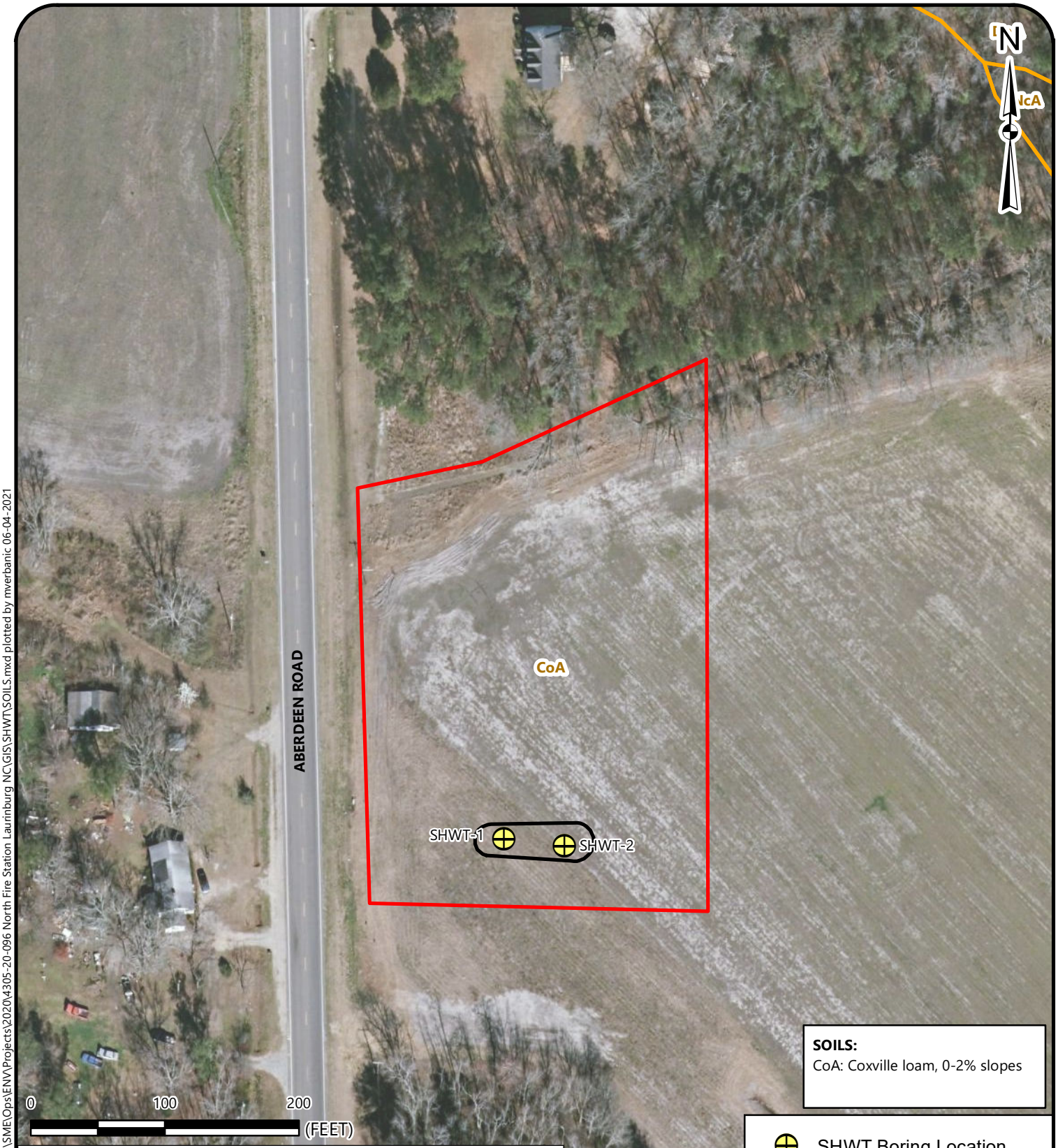
Sincerely,
S&ME, Inc.

Walter Cole, LSS, REHS
Senior Project Manager

Thomas P. Raymond, PE
Environmental Area Manager

Enclosed: **Figure 1**: USDA-SCS Scotland County Soil Survey Exhibit
Figure 2: USGS Topographic Exhibit
Figure 3: Stormwater Soil Evaluation Exhibit

Figures



SOILS:
CoA: Coxville loam, 0-2% slopes

SHWT Boring Location
Soil Map Unit
Proposed SCM
Proposed Fire Station Site

REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM THE 2017 NCONEMAP AERIAL ORTHOIMAGERY LAYER AND THE USDA-NRCS SOIL SURVEY AREA NC165 GEODATABASE. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

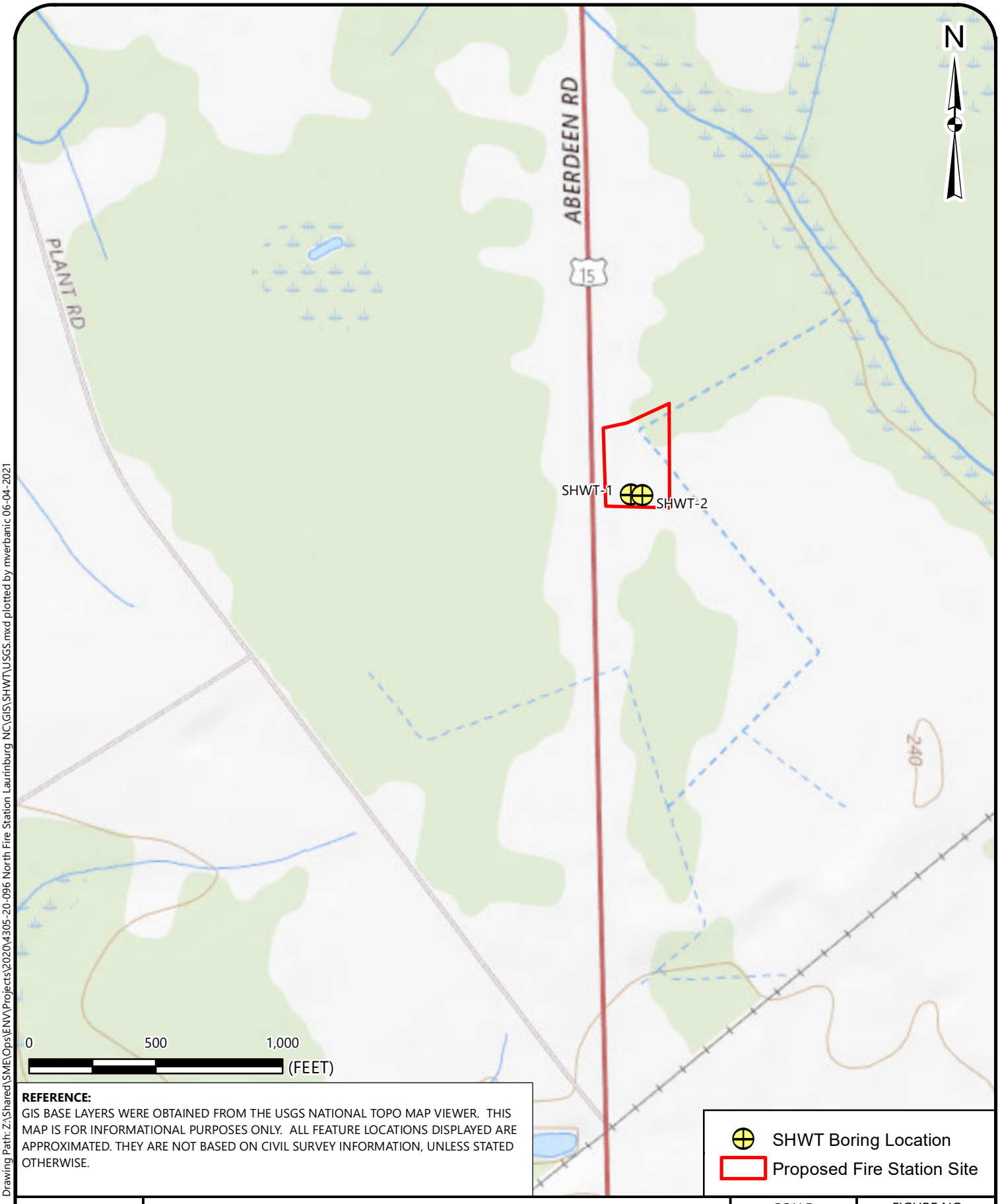
Drawing Path: Z:\Shared\SME\Ops\ENV\Projects\2020\4305-20-096 North Fire Station Laurinburg NC\GIS\SHWT\SOILS.mxd plotted by mverbanic 06-04-2021

USDA-NRCS SOIL SURVEY EXHIBIT

PROPOSED NORTH FIRE STATION
ABERDEEN ROAD
LAURINBURG, SCOTLAND COUNTY, NORTH CAROLINA

SCALE: 1 " = 100 '
DATE: 6-4-21
PROJECT NUMBER 4305-20-096

FIGURE NO. 1



REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM THE USGS NATIONAL TOPO MAP VIEWER. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

SHWT Boring Location
Proposed Fire Station Site

USGS TOPOGRAPHIC EXHIBIT

PROPOSED NORTH FIRE STATION
ABERDEEN ROAD
LAURINBURG, SCOTLAND COUNTY, NORTH CAROLINA

SCALE: 1 " = 500 '
DATE: 6-4-21
PROJECT NUMBER 4305-20-096

FIGURE NO. 2

Drawing Path: Z:\Shared\SME\Ops\ENV\Projects\2020\4305-20-096 North Fire Station Laurinburg NC\GIS\SHWT\USGS.mxd plotted by mverbanic 06-04-2021

Soil Profile Descriptions
Boring SHWT-1

S&ME Project Number: 4305-20-096 Boring Date: June 31, 2021 Landscape Position: Flat, concave

Horizon	Depth (in)	Color (Matrix)	Color (Mottles)	Texture	Grade	Structure	Moist Consistence	Notes	USDA Estimated Permeability (in/hr)	USDA Estimated Conductivity (in/hr)
A	0-10	10YR 3/2		sandy loam	weak	granular	very friable		2 - 6	1.4 - 14
Btg1	10-30	10YR 5/1	10YR 5/8	sandy clay	weak	subangular blocky	firm - very firm		0.06 - 0.2	0.014 - 0.14
Btg2	30-48+	10YR 5/1	10YR 6/8 2.5YR 4/8	clay	weak	angular blocky - massive	very firm		0.06 - 0.2	0.014 - 0.14

Estimated SHWT depth from EGS: 10 inches (0.8 feet)
Measured OWT depth from EGS: >48 inches (>4.0 feet)
Depth to auger refusal: >48 inches (>4.0 feet)

Boring SHWT-2

S&ME Project Number: 4305-20-096 Boring Date: June 31, 2021 Landscape Position: Flat, concave

Horizon	Depth (in)	Color (Matrix)	Color (Mottles)	Texture	Grade	Structure	Moist Consistence	Notes	USDA Estimated Permeability (in/hr)	USDA Estimated Conductivity (in/hr)
A	0-3	10YR 3/2		sandy loam	weak	granular	very friable		2 - 6	1.4 - 14
Beg	3-8	10YR 4/1		sandy clay loam	weak	subangular blocky	friable		0.6 - 2	0.14 - 1.4
Btg2	8-22	10YR 5/1	10YR 6/6	sandy clay	weak	angular blocky	firm - very firm		0.06 - 0.2	0.014 - 0.14
Btg3	22-48+	10YR 4/1	10YR 6/8 2.5YR 4/6	clay	weak	angular blocky - massive	very firm		0.06 - 0.2	0.014 - 0.14

Estimated SHWT depth from EGS: 8 inches (0.7 feet)
Measured OWT depth from EGS: >48 inches (>4.0 feet)
Depth to auger refusal: >48 inches (>4.0 feet)

REFERENCE:
GIS BASE LAYERS WERE OBTAINED FROM THE 2017 NCONEMAP AERIAL ORTHOIMAGERY LAYER AND THE JUNE 2020 SCOTLAND COUNTY PARCEL SHAPEFILE. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.

STORMWATER SOIL EVALUATION EXHIBIT

PROPOSED NORTH FIRE STATION
ABERDEEN ROAD
LAURINBURG, SCOTLAND COUNTY, NORTH CAROLINA

SCALE: 1 " = 50 '
DATE: 6-4-21
PROJECT NUMBER: 4305-20-096
FIGURE NO. 3

1.1 BID INFORMATION

A. Bidder: _____.

B. Project Name: Laurinburg North Fire Station

C. Project Location: 17501 Aberdeen Rd, Laurinburg, NC 28352.

D. Owner: City of Laurinburg

E. Architect: Creech & Associates.

F. Architect Project Number: 2020-062.

1.2 CERTIFICATIONS AND BASE BID

A. 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 Creech & Associates and 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, for the stipulated sum of:

_____ Dollars ($_____).

(Base bid sum shall not include the sum of any alternate cost stated in this document.)

1.3 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%) 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.

1.4 ALTERNATE BID PRICES:

A. The following Alternate Prices, representing the total cost to the Owner when the scope of the work is changed and when approved by the Architect, are hereby submitted, and are guaranteed to remain valid and in force for the duration of the construction period. Refer to Division 01 Section "Alternates" for descriptions of Alternates and conditions for submittal of Alternate pricing. Indicate whether alternates are additions or deductions from Bid Sum.

B. Alternate No. 1: $_____(Add / Deduct)

Provide the work identified as alternate #1 on sheet A21.01 & other applicable sheets for two (2) additional apparatus bays beyond Apparatus Bay – 100 in addition to upgade of finished materials in the rooms identified. This would include all trades associated with this alternate.

Alternate No. 2: $_____(Add / Deduct)

Provide the work identified as alternate #2 on sheet A21.01 & other applicable sheets for the converting the Office/Lobby - 104 into 3 individual offices, Office/Lobby - 104, Office 2 – 105 and Office 3 - 106. This would include all trades associated with this alternate.

Alternate No. 3: $_____(Add / Deduct)

Provide the work identified as alternate #3 on sheet A21.01 & other applicable sheets for converting Sleeping - 112 into 3 individual sleeping rooms, Sleeping – 112, Sleeping – 113 and Sleeping 114.This would include all trades associated with this alternate.

Alternate No. 4: $_____(Add / Deduct)

Provide the work identified as alternate #4 on sheet A21.01 & other applicable sheets for updating the finishes and adding a ceiling in the Training Room - 107. This would include all trades associated with this alternate.

Alternate No. 5: $_____(Add / Deduct)

Provide the work identified as alternate #5 on sheet A21.01 & other applicable sheets for converting Laundry / Ice / Tool / Deconstruction – 103 into 2 individual rooms, Tool / Deconstruction – 102 and Laundry / Ice - 103. This would include all trades associated with this alternate.

1.5 UNIT PRICES:

A. Unit prices conform to applicable project specification section. Refer to the specifications for a complete description of the following Unit Prices:

B. Unit Price No. 1:

Unsatisfactory Soil Mass : Add $_____ Deduct $_____

Unit Price No. 2:

Unsatisfactory Soil Trench: Add $_____ Deduct $_____

Unit Price No. 3:

Earth Import from Surrounding Site: Add $_____ Deduct $_____

Unit Price No. 4:

Earth Import from Off Site: Add $_____ Deduct $_____

1.6 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 _____ calendar days.

1.7 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 _____.
5. None _____.

1.8 BID SUPPLEMENTS

A. The following supplements are a part of this Bid Form and are attached hereto.
1. Bid Form Supplement - Bid Bond Form (AIA Document A310).

1.9 CONTRACTOR'S LICENSE

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

1.10 HUB PARTICIPATION ACKNOWLEDGEMENT

A. The undersigned further states that they have satisfied all state requirements for HUB participation.

B. Required documents & affidavits attached at the end of bidding form. No bids will be accepted with missing or incomplete HUB forms.

1.11 SUBMISSION OF BID

A. Respectfully submitted this _____ day of _____, 2021.

B. Submitted By_____(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).

F. Witness By:_____(Handwritten signature).

G. Attest:_____(Handwritten signature).

H. By:_____(Type or print name).

I. Title:_____(Corporate Secretary or Assistant Secretary).

J. Street Address:_____.

K. City, State, Zip_____.

L. Phone:_____.

M. License No.:_____.

N. Federal ID No.:_____(Affix Corporate Seal Here).

END OF DOCUMENT 00 41 13

Identification of HUB Certified/ Minority Business Participation

I,_____,
(Name of Bidder)
do hereby certify that on this project, we will use the following HUB Certified/ minority business as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work Type	*Minority Category	**HUB Certified (Y/N)

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

The total value of minority business contracting will be ($)_____.

State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

(Name of Bidder)

Affidavit of_____

I have made a good faith effort to comply under the following areas checked:

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

- ❑ **1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- ❑ **2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- ❑ **3** – **(15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ❑ **4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- ❑ **5** – **(10 pts)** Attended prebid meetings scheduled by the public owner.
- ❑ **6** – **(20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ❑ **7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- ❑ **8** – **(25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- ❑ **9** – **(20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- ❑ **10** - **(20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of_____, County of_____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract with Own Workforce.

County of _____

Affidavit of _____
(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the _____

_____ contract.
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20___

Notary Public _____

My commission expires _____

Do not submit with bid Do not submit with bid Do not submit with bid Do not submit with bid

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by HUB Certified/Minority Businesses

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by HUB certified/minority businesses as defined in GS143-128.2(g) and 128.4(a),(b),(e) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit.
This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. Attach additional sheets if required

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

SEAL

Signature:_____

Title:_____

State of _____, County of _____
Subscribed and sworn to before me this _____day of _____20____
Notary Public_____
My commission expires_____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 10% participation by HUB Certified/ minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with HUB certified/ minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. (Attach additional sheets if required)

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

***Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

****** HUB Certification with the state HUB Office required to be counted toward state participation goals.**

Examples of documentation that may be required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public_____

My commission expires _____

1.1 FORM OF AGREEMENT

A. The following form of Owner/Contractor Agreement shall be utilized for the Project:

1. AIA Document A101, Owner-Contractor Agreement Form, 2017 Edition.

END OF DOCUMENT 00 52 00

1.1 GENERAL CONDITIONS

A. General Conditions for the Project are AIA Document A201-1997 General Conditions of the Contract for Construction.

B. The above document is hereby incorporated by reference.

C. Copies of AIA standard forms may be obtained from:

1. American Institute of Architects, Charlotte, NC: (704) 369-2302.

END OF DOCUMENT 00 72 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Work covered by the Contract Documents.
   2. Type of the Contract.
   3. Work schedule and sequence.
   4. Use of premises.
   5. Work restrictions.
   6. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Laurinburg North Fire Station.
   1. Project Location: 16800A N 401 Bypass Highway, Laurinburg, North Carolina.
   2. Owner: City of Laurinburg, NC.

B. Architect Identification: The Contract Documents, dated September 15, 2021, were prepared for Project by Creech & Associates, 1000 West Morehead Street, Suite 120, Charlotte, NC 28208.

C. The Work consists of building a new fire station for the City of Laurinburg. This is to replace the existing North Fire Station that has been damaged by flooding. The new fire station will be a pre-engineered building with metal siding and a metal roof. The building will have 3 apparatus bays, a kitchen, bathrooms, a day room, a tool room, and a training room. There are several alternatives that takes the apparatus bays from 3 to 5 and finishes some of the interior space into separate spaces verses a large common space.

1.4 CONTRACTS

A. Project will be constructed under a general construction contract.

1.5 WORK SCHEDULE AND SEQUENCE

A. The Work shall be conducted in a single phase, with the date of Substantial Completion to be as indicated in the Agreement**.**

1.6 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
   1. Driveways 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 storage of materials.
      a. Schedule deliveries to minimize use of driveways and entrances.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

B. Deliveries: Provide representative to receive all materials and offload at the job site. The Owner will refuse all deliveries to other locations.

C. Personnel Identification: All construction personnel in occupied portions of the facility must wear Contractor-furnished identification badges at all times. Personnel without proper identification are subject to removal from the site by the Owner.

D. Safety and Security: Comply with Owner's requirements related to security and fire drills and alerts.

E. Burning/Welding Operations: Comply with Owner's requirements related to Burning and Welding permits. Coordinate turning off of fire/smoke detection systems in affected areas. Contractor shall be responsible for Fire Department response fees related to construction operations.

F. Smoking: No smoking is allowed on the premises, except within 20 feet of the Contractor's job office trailer or as otherwise designated by Owner's representative.

G. Use of Site: Limit use of premises to indicated areas within the Contract limits. Do not disturb portions of Project site beyond areas in which the Work is indicated.

   a. Limits: Confine constructions operations to areas indicated on Civil Drawings.

1.7 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 9:00 p.m., Monday through Friday, except otherwise indicated.

   1. Weekend Hours:
      a. Saturday Hours: 8:00 a.m. to 6:00 p.m.
      b. Sunday Hours: 1:00 p.m. to 6:00 p.m.
   2. Early Morning Hours: Restrict noisy work until after 7:00 a.m.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 33-division format and CSI/CSC's "MasterFormat" numbering system.

B. 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. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred, as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
   2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
      a. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

B. Related Sections include the following:

1. Division 01, Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.2 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Supplement Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included at the end of this Section. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Unit Price No. 1: Unsatisfactory Soil Excavation and Replacement (Mass).

1. Description: Unsatisfactory soil excavation and [disposal offsite] and replacement with compacted engineered fill provided from offsite, in accordance with Section 31 00 00 "Earthwork."
2. Unit of Measurement: Cubic yard of earth excavated, based upon survey of volume removed measured in place by geotechnical engineer.

B. Unit Price No. 2: Unsatisfactory Soil Excavation and Replacement (Trench).

1. Description: Unsatisfactory soil excavation and [disposal offsite] and replacement with compacted engineered fill provided from offsite, in accordance with Section 31 00 00 "Earthwork."
2. Unit of Measurement: Cubic yard of earth excavated, based upon survey of volume removed measured in place by geotechnical engineer.

C. Unit Price No. 3: Earth Import from Surrounding Site

1. Description: Importing compacted engineered fill or satisfactory soil, as required, provided from surrounding site, in accordance with Section 31 00 00 "Earthwork."
2. Unit of Measurement: Cubic yard of rock excavated, based upon survey of volume removed measured in place by geotechnical engineer.

D. Unit Price No. 4: Earth Import from Off Site

1. Description: Importing compacted engineered fill or satisfactory soil, as required, provided from offsite, in accordance with Section 31 00 00 "Earthwork."
2. Unit of Measurement: Cubic yard of rock excavated, based upon survey of volume removed measured in place by geotechnical engineer.

END OF SECTION 01 22 00

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Additional 2 Apparatus Bays

1. Base Bid: 3 apparatus bays
2. Alternate: Construct two (2) additional apparatus bays beyond Apparatus Bay - 100. Upgrade finishes based upon the finishes listed in the finish schedule. This would include all trades associated with this alternate.

B. Alternate No. 2: Divide single office into three individual offices

1. Base Bid: Room 104
2. Alternate: Room 104 divided into 3 individual offices, Office/Lobby - 104, Office 2 – 105 and Office 3 - 106

C. Alternate No. 3: Divide single sleeping room into three sleeping rooms

1. Base Bid: Room 112
2. Alternate: Room 112 divided into 3 individual sleeping rooms, Sleeping – 112, Sleeping – 113 and Sleeping 114.

D. Alternate No. 4: Upfit Training Room

1. Base Bid: Rubber flooring with rubber base, ceiling open to structure

2. Alternate: Carpet tile flooring with wooden base, 2x2 ACT ceiling installed as shown in the drawings

E. Alternate No. 5: Divide single tool room into two rooms
   1. Base Bid: Room 103
   2. Alternate: Room 103 divided into two separate rooms 2 individual rooms, Tool / Deconstruction – 102 and Laundry / Ice - 103

END OF SECTION 01 23 00

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

1.3 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, "Architect's Supplemental Instructions."

1.4 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. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Within 20 days 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 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.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.
   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 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.
   5. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use AIA Document G709.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. 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

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with Continuation Sheets.
      b. Submittals Schedule.
      c. Contractor's Construction Schedule.
   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: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

B. Format and Content: Use the 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. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Submit draft of AIA Document G703 Continuation Sheets.
   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.
         1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
   4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.
   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 specified, include evidence of insurance or bonded warehousing.
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. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. 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 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.
10. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each 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 the 15th day of each month, unless otherwise specified in the Agreement. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends 15 days before the date for each progress payment.
C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets 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 of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
E. Transmittal: Submit 4 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.
F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
G. 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. Schedule of unit prices.
6. Submittals Schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.

H. Application for Payment at Substantial Completion: After issuing 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.
   2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Submittals that must precede or coincide with submittal of Application for Payment at Substantial Completion include the following:
   1. Operation and Maintenance Data final submittal.

J. Final Payment Application: 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. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
   5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
   6. AIA Document G707, "Consent of Surety to Final Payment."
   7. Evidence that claims have been settled.
   8. 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.
   9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General Project coordination procedures.
   2. Coordination Drawings.
   3. Requests for Information.
   4. Project meetings.

B. See Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in various 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 with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.
   4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. 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.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors 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.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
   a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b. Indicate required installation sequences.
   c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 48 by 36 inches.
3. Number of Copies: Submit two opaque copies of each submittal. Architect will return one copy.
4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
5. **Mechanical Coordination Drawings:** Contractor shall organize coordination meetings to develop a set of Drawing with all major subcontractors (electrical, mechanical, plumbing, and fire protection), with the mechanical subcontractor having lead responsibility for the original Drawings and shall forward those Drawing to each of the major subcontractors for them to add their systems to this set of Coordination Drawings.
   a. Comply with note on Mechanical Drawings, "Coordination Drawings".
   b. Architect's approval of Coordination Drawings is required prior to issue and construction.

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 and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

C. Requests for Information: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on CSI Form 13.2A, "Request for Interpretation" or on attached form.

D. Submittal of RFIs: Submit Request for Information to Architect in accordance with the following procedures:

1. Submit RFI as soon as issue requiring clarification arises on form provided in this Project Manual. Allow minimum of 10 days for response from Architect.
2. Completely identify all work affected by RFI by reference to all pertinent drawing numbers and specification paragraphs.
3. Clearly identify field conditions or as-built conditions that affect work on sketches attached to RFI.
4. If RFI addresses conflict in Contract Documents, clearly describe all dimensions, materials and other data necessary to enable Architect to respond to RFI.
5. Include suggested solution to issue addressed in RFI. If, upon review of RFI by Architect, suggested solution is determined to affect construction time or costs, submit Proposal Request

as described below. If no time or cost is involved, Architect will issue Architect's Supplemental Instruction (ASI) in response.

6. Allow each subcontractor or supplier involved or affected by RFI to review request before submission to Architect.
7. Incomplete RFIs, and RFIs that in the opinion of the Architect address issues adequately represented in the documents, will not be considered, and will be returned to Contractor.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
   1. Include special personnel required for coordination of operations with other contractors.

1.6 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: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.

B. Preconstruction Conference: Schedule 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. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
   1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing.
      d. Designation of responsible personnel.
      e. Procedures for processing field decisions and Change Orders.
      f. Procedures for processing Applications for Payment.
      g. Distribution of the Contract Documents.
      h. Submittal procedures.
      i. Preparation of Record Documents.
      j. Use of the premises.
      k. Responsibility for temporary facilities and controls.
      l. Parking availability.
      m. Office, work, and storage areas.
      n. Equipment deliveries and priorities.
      o. First aid.
      p. Security.
      q. Progress cleaning.
      r. Working hours.

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 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 Change Orders.
    d. Purchases.
    e. Deliveries.
    f. Submittals.
    g. Review of mockups.
    h. Possible conflicts.
    i. Compatibility problems.
    j. Time schedules.
    k. Weather limitations.
    l. Manufacturer's written recommendations.
    m. Warranty requirements.
    n. Compatibility of materials.
    o. Acceptability of substrates.
    p. Temporary facilities and controls.
    q. Space and access limitations.
    r. Regulations of authorities having jurisdiction.
    s. Testing and inspecting requirements.
    t. Required performance results.
    u. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements.
4. 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. Progress Meetings: Conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests.
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 conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. 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.

    b. Review present and future needs of each entity present, including the following:
        1) Interface requirements.
        2) Sequence of operations.

3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Requests for interpretations (RFIs).
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

3. Minutes: Record and distribute the meeting minutes to Architect.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
   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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Preliminary Construction Schedule.
   2. Contractor's Construction Schedule.
   3. Submittals Schedule.
   4. Daily construction reports.
   5. Material location reports.
   6. Field condition reports.
   7. Special reports.

B. Related Sections include the following:
   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.

1.3 SUBMITTALS

A. 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.

B. Contractor's Construction Schedule: Submit two printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.

C. CPM Reports: Concurrent with CPM schedule, submit three copies of each of the following computer-generated 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.

D. Daily Construction Reports: Submit two copies at weekly intervals.

E. Material Location Reports: Submit two copies at weekly intervals.
F. Field Condition Reports: Submit two copies at time of discovery of differing conditions.
G. Special Reports: Submit two copies at time of unusual event.

1.4 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, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from parties involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 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. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 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 of Award. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was 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 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.3 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.
B. 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. 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 Actual Completion percentage for each activity.

B. 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.

END OF SECTION 01 32 00

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections include the following:

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 and distributing meeting and conference minutes and for submitting Coordination Drawings.
3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
4. Division 01 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
5. Division 01 Section "Closeout Procedures" for submitting warranties.
6. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
7. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
8. Divisions 02 through 33 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Technical Submittals and Action Submittals: Written and graphic information (data and drawings) that require Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. 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. 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.

B. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

C. Processing Time: Allow enough 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 required, allow 21 days for initial review of each submittal.

D. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:
a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. Number and title of appropriate Specification Section.
i. Drawing number and detail references, as appropriate.
j. Location(s) where product is to be installed, as appropriate.
k. Reference identification procedures in this Section under "Technical and Action Submittals".
l. Other necessary identification.

E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

F. Additional 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.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. Transmittal Form: Use Contractor's standard form, with information and format specified in this Section.
2. Transmittal Form: Provide locations on form for the following information:
a. Project name.
b. Date.
c. Destination (To:).
d. Source (From:).
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Submittal purpose and description.
h. Specification Section number and title.
i. Drawing number and detail references, as appropriate.
j. Transmittal number.
k. Submittal and transmittal distribution record.
l. Remarks.
m. Signature of transmitter.
3. 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 label information as related submittal.

H. 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 "APPROVED" or "APPROVED AS NOTED".

I. 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.

J. Use for Construction: Use only final submittals with mark indicating "APPROVED" or "APPROVED AS NOTED" taken by Architect.

PART 2 - PRODUCTS

2.1 TECHNICAL SUBMITTALS AND ACTION SUBMITTALS

A. General: Prepare and submit Technical and Action Submittals required by individual Specification Sections, and as follows:
   1. Identify each submittal separately using the CDI Division and sequential numbering i.e., 001-03 30 00-000, 002-03 30 00-0000, etc. Resubmittals must be returned using the same number previously used, plus a numeric suffix, i.e., 001-03 30 00-001, 001-03 30 00-002, etc.
   2. Review and stamp each submittal with Contractor's stamp.
   3. MSDS sheets are not to be included.
   4. Package each submittal individually using separate transmittals.
   5. Provide six copies of each initial technical submittal and six copies of each resubmittal. Three copies will be returned. Mark up and retain one returned copy as a Project Record Document.

B. 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 printed 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 written recommendations.
      b. Manufacturer's product specifications.
      c. Manufacturer's installation instructions.
      d. Standard color charts.
      e. Manufacturer's catalog cuts.
      f. Wiring diagrams showing factory-installed wiring.
      g. Printed performance curves.
      h. Operational range diagrams.
      i. Mill reports.
      j. Standard product operation and maintenance manuals.
      k. Compliance with specified referenced standards.
      l. Testing by recognized testing agency.
      m. Application of testing agency labels and seals.
      n. Notation of coordination requirements.
   4. Submit Product Data before or concurrent with Samples.

C. 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. Dimensions.
      b. Identification of products.
      c. Fabrication and installation drawings.
      d. Roughing-in and setting diagrams.
      e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.

f. Shopwork manufacturing instructions.
g. Templates and patterns.
h. Schedules.
i. Design calculations.
j. Compliance with specified standards.
k. Notation of coordination requirements.
l. Notation of dimensions established by field measurement.
m. Relationship to adjoining construction clearly indicated.
n. Seal and signature of professional engineer if specified.
o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.

D. 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 appropriate Specification Section.
3. 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.
4. 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: Provide six copies of each sample for initial selection. Three copies will be returned. Architect will return submittal with options selected.
5. 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: Provide six copies of each sample for verification. Three copies 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.

E. Product Schedule or List: 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.
2. Number and name of room or space.

3. Location within room or space.
4. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Architect will return two copies.
    a. Mark up and retain one returned copy as a Project Record Document.

F. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. 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.
4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Architect will return two copies.
    a. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.
1. Number of Copies: Submit three 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 specified in Division 01 Section "Quality Requirements."

B. Coordination Drawings: 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. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare 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.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

J. Material Test Reports: Prepare 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.

K. Product Test Reports: Prepare written reports indicating 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.

L. Research/Evaluation Reports: Prepare 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.

M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

N. Preconstruction Test Reports: Prepare 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.

O. Compatibility Test Reports: Prepare 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.

P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, 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.

Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

R. Design Data: Prepare 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.

S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
   1. Preparation of substrates.
   2. Required substrate tolerances.
   3. Sequence of installation or erection.
   4. Required installation tolerances.
   5. Required adjustments.
   6. Recommendations for cleaning and protection.

T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
   1. Name, address, and telephone number of factory-authorized service representative making report.

2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

V. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect, except as required in "Action Submittals" Article.

2.3 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.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, licensed in the State of North Carolina (or licensed where project is located if another state), 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.
   2. Identify, review, stamp and submit each submittal separately using the CSI Division number as described above in Technical Submittals.
   3. Provide four copies signed and sealed by the responsible design professional.
      a. Two copies will be returned.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. 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. 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.

3.2 ARCHITECT'S / ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
   1. NO EXCEPTIONS TAKEN. Fabrication and installation may proceed. Do not resubmit shop drawings.
   2. EXCEPTIONS INDICATED. Correct and resubmit shop drawings for final review. Do not fabricate or install.

3. REVISE & RESUBMIT. Major nonconformance with requirements. Prepare new shop drawings. Do not fabricate nor install.
4. REJECTED. Submittal rejected in its entirety.
5. RETURNED – REVIEW ONLY. Architect has reviewed information submitted and is returning to Contractor for his records.
6. NOT REQUIRED / NOT REVIEWED. Architect's action is not required.

C. 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.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 33 00

PART 1 - GENERAL

1.1 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. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
2. 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. See Divisions 02 through 33 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical assemblies that are constructed on-site. 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. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. General: 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.

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.

1.4 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. 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.

C. 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.

D. 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.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. 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.

C. 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, as well as sufficient production capacity to produce required units.

D. 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.

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 products that are similar to those indicated for this Project in material, design, and extent.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

G. 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.

H. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
   d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
   e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
   f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
2. 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.

I. 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.

1.6 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.
   2. 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, and the Contract Sum will be adjusted by Change Order.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
   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 same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies at least 24 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. 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.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

E. 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, in duplicate, of each test, inspection, and similar quality-control service 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.

F. 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.

G. 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.
   2. Do not install finishes until required inspection of concealed construction is completed and work approved.
      a. Coordinate in-wall and above-ceiling inspection by authorities having jurisdiction and observation by Architect.

H. 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.

I. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
   1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
   2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
   4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Comply with the Contract Document requirements for Division 01 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

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Refer to individual technical specification sections for specific qualifications, inspections, tests, frequency and standards required.

1.2 GENERAL REQUIREMENTS

A. Special Inspections shall be in accordance with Chapter 17 of the International Building Code.

B. The program of Special Inspection is a system intended to ensure that the work is performed in accordance with the Contract Documents. These services do not relieve the Contractor and/or the Construction Manager of responsibility for compliance with the requirements of the Contract Documents.

C. This specification section is intended to inform the Contractor and/or the Construction Manager of the Owner's Special Inspection program and the extent of the responsibilities. This specification section is also intended to notify the Special Inspector, Testing Company/Testing Laboratory, and other Agents of the Special Inspector of their requirements and responsibilities.

D. Perform inspections in accordance with industry standard referenced for specific material or procedure unless other criteria are specified. In the absence of a referenced standard, perform inspections in accordance with generally accepted industry standards.

E. Failure to detect defective work or materials shall in no way prevent later rejection if defective work or materials are discovered.

1.3 SCHEDULE OF SPECIAL INSPECTIONS

A. Required Special Inspections are described in the attached Statement of Special Inspections.

1.4 DEFINITIONS

A. Testing: Evaluation of systems, primarily requiring physical manipulation and analysis of materials, in accordance with approved standards.

B. Inspection: Evaluation of systems, primarily requiring observation and judgment.

C. Special Inspection: Special Inspection herein includes items required by the current State Building Code, and other items which in the professional judgment of the Structural Engineer of Record, are critical to the integrity of the building structure.

D. Structural Engineer of Record (SER): The Licensed Engineer in responsible charge of the structural design for the project.

E. Testing Agency (TA):

1. Testing Agency: Approved independent materials testing agency acceptable to the Owner, Architect, and SER.

F. Special Inspector (SI): A licensed professional engineer responsible for administering and performing all Special Inspections required by the Statement of Special Inspections.

G. Agents of Special Inspection (AI): Individual inspectors performing specific Special Inspections on behalf of the Special Inspector.

H. Building Official: The Officer or duly authorized representative charged with the administration and enforcement of the State Building Code.

1.5 QUALIFICATIONS

A. The Special Inspector shall be a licensed Professional Engineer (licensed in state in which project is located) experienced with the type of work requiring Special Inspections, who is approved by the Owner, Structural Engineer of Record (SER) and Building Official.

B. Required inspector's qualifications for the Special Inspector and Agents of the Special Inspector are described in the attached Statement of Special Inspection.

1.6 SUBMITTALS

A. The Special Inspector shall submit to the Owner for review a copy of their qualifications which shall include the names and qualifications of each of the agents of Special Inspection who will be performing inspections.

1.7 PAYMENT

A. The Owner shall engage and pay for the services of the Special Inspector and Agents of the Special Inspector.

B. The Contractor and/or Construction Manager shall be responsible for the cost of any re-inspection of work which fails to comply with the requirements of the Contract Documents.

1.8 RESPONSIBILITIES/AUTHORITY

A. Special Inspection:

1. Special Inspector and Agents of Special Inspections:
    a. Sign the Statement of Special Inspection in conjunction with other responsible parties prior to commencing construction.
    b. Inspect the work assigned for conformance with the contract documents and applicable material and workmanship provisions of the code. Perform inspection in a timely manner to avoid delay of work.
    c. Bring nonconforming items to the immediate attention of the Contractor and/or Construction Manager for correction, then, if uncorrected after a reasonable period of time, to the attention of the Structural Engineer of Record, the Building Official, and to the Owner.
    d. Submit inspection reports to the Contractor and/or Construction Manager, the Structural Engineer of Record, Owner, and other designated persons in accordance with the Statement of Special Inspection.
    e. Submit a final signed report stating whether the work requiring Special Inspection was, to the best of the Special Inspector's knowledge, in conformance with the contract documents and the applicable workmanship provisions of the code.
2. Architect:
    a. Expedite resolution of construction issues.
3. Structural Engineer of Record:
    a. Identify items requiring Special Inspection and define qualifications of special inspector required for work.
    b. Prepare and sign the Statement of Special Inspection in conjunction with other responsible parties prior to commencing construction.
    c. Review reports issued by Special Inspector.
    d. Assist in resolution of construction issues identified by Special Inspector.
4. Testing Agency:
    a. When engaged as a special inspector, provide Special Inspection services as noted in Item 1.8.A.1.
    b. Copy Special Inspector on all materials testing reports.
5. Contractor/Construction Manager:

a. Arrange and attend all pre-construction meetings to review scope of Special Inspection. Include the Building Official, Owner, Architect, Structural Engineer of Record, Special Inspector, Testing Agency and other parties concerned.
b. Post or make available the Statement of Special Inspection within the project site office. Provide timely notification to those parties designated on the schedule so they may properly prepare for and schedule their work.
c. Provide special inspector access to the approved plans and specifications at the project site.
d. Review all reports issued by special inspector.
e. Retain at the project site all reports submitted by the special inspector for review by the building official upon request.
f. Correct, in a timely manner, deficiencies identified in inspection reports.
g. Provide safe access to the work requiring inspection.
h. Provide labor and facilities to provide access to the work and to facilitate inspection.
i. Sign the Contractor's Statement of Responsibility, if required, prior to commencing construction.

6. Fabricator/Supplier:
   a. Submit one copy of all material certificates and other quality assurance documents as required in the Statement of Special Inspections to the Special Inspector.
7. Building Official:
   a. Accept and sign completed Statement of Special Inspection.
   b. Review the final report submitted by special inspector.
   c. Determine work, which, in the Building Officials opinion, involves unusual hazards or conditions (IBC 1704.13 – Special Cases).
8. Owner:
   a. Provide and pay cost of Special Inspection services.
   b. Provide special inspector with Contract Documents and accepted shop drawings.
   c. Provide special inspector with full access to the site at all times.
   d. Sign the Statement of Special Inspection in conjunction with other responsible parties prior to commencing construction.

1.9 INSPECTION NOTES

A. Contractor and/or Construction Manager provide minimum of 24 hours notice for all items requiring inspection. Do not construct items requiring inspection services until testing and inspection services are available. Do not enclose or obscure items requiring inspection services until inspection services are performed.

1.10 LIMITS ON AUTHORITY

A. The Special Inspector may not release, revoke, alter, or increase the requirements of the Contract Documents.
B. The Special Inspector will not have control over the Contractor and/or Construction Manager means or methods of construction.
C. The Special Inspector shall not be responsible for construction site safety.
D. The Special Inspector has no authority to stop the work.

1.11 DAILY RECORDS AND REPORTS

A. Detailed daily reports shall be prepared by Special Inspector and Agents of Special Inspection of each inspection and submitted to the Special Inspector. Reports shall include, but not be limited to:
   1. Date of inspection.
   2. Name of inspector or agent.
   3. Location of specific areas inspected.
   4. Description of inspection and results.
   5. Applicable ASTM standard.
   6. Weather conditions.
   7. Identification of product and specification section.

B. Any discrepancies from the Contract Documents found during a Special Inspection shall be immediately reported to the Contractor and/or Construction Manager. If the discrepancies are not corrected, the Special Inspector shall notify the Structural Engineer of Record and Owner. Reports shall document all discrepancies identified and the corrective action taken.

C. The Testing Company/Testing Laboratory shall immediately notify the Special Inspector of any test results which fail to comply with the requirements of the Contract Documents.

1.12 MONTHLY REPORTS

A. Monthly reports shall be prepared by the Special Inspector. Reports shall include, but not be limited to:
   1. Summary of elements inspected during that month.
   2. Copies of all discrepancies noted during that month.
   3. Report of status of discrepancies including resolution of discrepancies.
   4. Summary of all material certifications and quality assurance documents collected and reviewed during that month.

1.13 FINAL REPORT OF SPECIAL INSPECTIONS

A. The Final Report of Special Inspections shall be completed by the Special Inspector and submitted to the Structural Engineer of Record, Owner, Contractor and/or Construction Manager, and Building Official prior to the issuance of a Certificate of Use and Occupancy.

B. The Final Report of Special Inspections will certify that all required inspections have been performed and will itemize any discrepancies and how those discrepancies were resolved.

END OF SECTION 01 41 00

Statement of Special Inspections

Project: Union County Sherriff's Office
Location: Monroe, NC
Owner's Representative:
Owner's Address:

This Statement of Special Inspections is submitted as a condition for permit issuance in accordance with the Special Inspection requirements of the 2018 North Carolina State Building Code. It includes a Schedule of Special Inspection Services applicable to this project, the name of the Special Inspector, the identity of other approved agencies retained for conducting Special Inspections, and the required inspector qualifications. This Statement of Special Inspections was prepared by the following Designers of Record:

Structural	Kirsten A Baldwin Metzger		
	(Type or print name)	(Signature)	(Date)
Architectural			
	(Type or print name)	(Signature)	(Date)
Mechanical			
	(Type or print name)	(Signature)	(Date)
Other			
	(Type or print name)	(Signature)	(Date)

The Special Inspector shall keep records of all special inspections and tests and shall furnish reports to the State Construction Office and the Designers of Record. Reports shall indicate if the work inspected or tested was or was not completed in conformance with the approved construction documents. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Designers of Record. The Special Inspections program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official, Owner, and the Designers of Record.

Interim Report Frequency: Monthly

A Final Report of Special Inspections documenting completion of all required Special Inspections, testing, and correction of any discrepancies should be submitted prior to issuance of a Certificate of Use and Occupancy.

Job Site safety and means and methods of construction are solely the responsibility of the Contractor.

Owner's Authorization

_____
Signature

Date

Schedule of Special Inspection Services [a]

The following sheets comprise the required schedule of special inspections for this project. The construction divisions which require special inspections for this project are as follows.

☒ Structural Steel & High Strength Bolting ☐ Helical Pile Foundations
☒ Welding of Structural Steel ☐ Rammed Aggregate Piers & Stone Columns
☒ Cold-Formed Steel Deck ☒ Sprayed Fire-Resistant Material
☒ Open-Web Steel Joists & Joist Girders ☐ Mastic & Intumescent Fire-Resistant Coatings
☐ Cold-Formed Steel Framing ☐ Exterior Insulation & Finish System
☒ Concrete Construction ☒ Fire-Resistant Penetrations & Joints
☐ Masonry Construction [b] ☐ Smoke Control
☐ Wood Construction ☒ Retaining Wall & Systems > 5 Feet
☒ Soils ☐ Special Inspections for Wind Resistance
☐ Driven Deep Foundations ☒ Special Inspections for Seismic Resistance
☐ Cast-in-Place Deep Foundations

a. The inspection frequency indicated on the following inspection tables are "C" continuous, "P" periodic, & "O" random on a daily basis.
b. Level A is the minimum inspection program for empirically / prescriptively designed masonry in Risk Category I, II or III structures.
Level B is the minimum inspection program for empirically / prescriptively designed masonry in Risk Category IV structures and
engineered masonry in Risk Category I, II or III structures. Level C is the minimum inspection program for engineered masonry in
Risk Category IV structures. Engineered masonry structures are those designed in accordance with portions of the TMS 402-13 /
ACI 530-13/ASCE 5-13 other than Part 4 or Appendix A.

Inspection Agents	Firm Name & Point of Contact	Address / Phone / E-mail
1. Special Inspector (SI-1)		
2. Testing Agency (TA-1)		
3. Testing Agency (TA-2)		
4. Geotechnical Engineer (GE-1)		
5. Other (O-1)		

Note: The inspection and testing agent(s) shall be engaged by the Owner or the Registered Design Professional of Record acting as the Owner's agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the State Construction Office, prior to commencing work.

Seismic Design Category:

☐ A
☐ B
☒ C
☐ D

Basic Wind Speed (V_{asd}):

☒ 90-109mph
☐ 110-119mph ☐ ≥120mph

Wind Exposure Category:

☒ B
☐ C
☐ D

Schedule of Special Inspection Services
Structural Steel and High-Strength Bolting

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			AISC	NCBC	
1. Fabricator Certification / Verification of Quality Control Procedures					
a. Verify fabricator qualifications	☒	C		1704.2.5.1	
b. Review material test reports & certifications	☒	C	N5.2		
c. Collect certificates of compliance from the steel fabricator at completion of fabrication	☒	C		1704.5	
2. Inspections Prior to High-Strength Bolting at Pretensioned and Slip-Critical Joints					
a. Collect manufacturer's certifications for fastener materials	☒	C	Table (Tbl) N5.6-1		
b. Fasteners are marked per ASTM requirements	☒	P	Tbl N5.6-1		
c. Ensure correct fasteners and bolting procedures are selected for joint details	☒	P	Tbl N5.6-1		
d. Verify connecting elements, including the appropriate faying surface condition and hole preparation when specified, comply with the construction documents	☒	P	Tbl N5.6-1		
e. Observe and document pre-installation verification testing by installation personal for fastener	☒	P	Tbl N5.6-1		

assemblies and methods					
f. Verify proper storage provided for all fastener components	☒	P	Tbl N5.6-1		
3. Inspections During High-Strength Bolting at Pretensioned and Slip-Critical Joints					
a. Ensure correct fastener assemblies placed in all holes and washers, when specified, are positioned as required	☒	P	Tbl N5.6-2		
b. Verify joint brought to snug-tight condition prior to pretensioning	☒	P	Tbl N5.6-2		
c. Verify fastener components not turned by the wrench prevented from rotating	☒	P	Tbl N5.6-2		
d. Ensure fasteners are pretensioned in accordance with RCSC, progressing from the most rigid point towards free edges	☒	P	Tbl N5.6-2		
4. Document acceptance or rejection of bolted connections after high-strength bolting is complete	☒	C	Tbl N5.6-3		
5. Structural Details					
a. Verify diameter, grade, type and length of anchor rods and other embedded items supporting structural steel	☒	P	N5.7		
b. Inspection of fabricated assemblies & erected steel fram-	☒	P	N5.7		

ing verifying compliance with the construction documents					
6. Composite Construction					
a. Verify placement & installation of steel deck	☒	P	Tbl N6.1		
b. Observe placement and installation of steel headed stud anchors	☒	P	Tbl N6.1		
c. Document acceptance or rejection of composite construction elements	☒	P	Tbl N6.1		

Schedule of Special Inspection Services
Welding of Structural Steel

Inspection Task	Task Req'd	Freq	Code Reference		Agent
			AISC	NCBC	
1. Inspections Prior to Welding			N5.4		
a. Collect & review welding procedure specification (WPS) and verify manufacturer certifications for welding consumables	☒	C	Table (Tbl) N5.4-1		
b. Confirm weld material type & grade	☒	P	Tbl N5.4-1		
c. Confirm method of welder identification	☒	P	Tbl N5.4-1		
d. Inspection of fit-up for groove & fillet welds including access hole configuration & finish	☒	P	Tbl N5.4-1		
2. Inspections During Welding			N5.4		
a. Verify welder qualifications	☒	P	Tbl N5.4-2		
b. Verify proper control and handling of welding consumables	☒	P	Tbl N5.4-2		

c. Monitor environmental conditions	☒	P	Tbl N5.4-2		
d. Monitor proper implementation of WPS	☒	P	Tbl N5.4-2		
e. Inspection of welding techniques including no welding over cracked tack welds	☒	P	Tbl N5.4-2		
3. Inspections After Welding			N5.4, N5.5		
a. Verify welds have been cleaned	☒	P	Tbl N5.4-3		
b. Confirm the installed size, length and location of welds matches the contract documents	☒	C	Tbl N5.4-3		
c. Verify welds meet visual acceptance criteria	☒	C	Tbl N5.4-3		
d. Confirm arc strikes comply with Part 5.28 of AWS D1.1	☒	C	Tbl N5.4-3		
e. Visually observe web k-area for cracks within 3” of welded doubler plates, continuity plates and stiffeners	☒	C	Tbl N5.4-3		
f. Backing and weld tabs removed per contract documents	☒	C	Tbl N5.4-3		
g. Observe and inspect weld repair activities	☒	C	Tbl N5.4-3		
h. For Risk Category III or IV structures, conduct ultrasonic testing (UT) of CJP groove welds in materials ≥ 5/16” at butt, T- and corner joints subject to transversely applied tension loading	☒	C	N.5.5b, N5.5e		
i. For Risk Category II structures, conduct ultrasonic testing (UT) of CJP groove welds in materials ≥ 5/16” at butt, T- and corner	☐	P	N.5.5b, N5.5f		

joints subject to transversely applied tension loading					
j. Conduct magnetic particle testing (MT) or liquid penetrant testing (PT) at thermally cut surfaces of access holes for rolled section with tf > 2" and built-up shape with tw > 2"	☐	C	N5.5c		
k. Radiographic or ultrasonic inspection at joints subject to fatigue	☐	C	N5.5d, Tbl A-3.1		
l. Document acceptance / rejection of welded joints and members	☒	C	Tbl N5.4-3, N5.5g		

Schedule of Special Inspection Services
Cold-Formed Steel Deck

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			SDI QA/QC	NCBC	
1. Prior to deck placement, verify deck and deck accessories comply with the construction documents	☒	C	Table (Tbl) 1.1		
2. Inspection Tasks After Deck Placement					
a. Verify the installation of deck & deck accessories complies with the construction documents	☒	C	Tbl 1.2		
b. Verify that deck materials' mill certifications comply with the construction documents	☒	C	Tbl 1.2		
3. Inspection Tasks Prior to Deck Welding					
a. Collect welding procedure specification (WPS)	☒	P	Tbl 1.3		
b. Collect manufacturer certifications for welding consumables	☒	P	Tbl 1.3		
c. Verify material type and grade	☒	P	Tbl 1.3		

d. Check welding equipment	☒	P	Tbl 1.3		
4. Inspection Tasks During Deck Welding					
a. Verify welder qualifications	☒	P	Tbl 1.4		
b. Verify proper control and handling of welding consumables	☒	P	Tbl 1.4		
c. Monitor environmental conditions	☒	P	Tbl 1.4		
d. Monitor proper implementation of WPS	☒	P	Tbl 1.4		
5. Inspection Tasks After Welding					
a. Verify size and location of welds, including support, sidelap and perimeter welds	☒	C	Tbl 1.5		
b. Verify welds meet visual acceptance criteria	☒	C	Tbl 1.5		
c. Observe weld repair activities	☒	C	Tbl 1.5		
6. Inspection Tasks Prior to Mechanical Fastening					
a. Verify manufacturer installation instructions available for mechanical fasteners	☒	P	Tbl 1.6		
b. Proper tools available for fastener installation	☒	P	Tbl 1.6		
c. Verify proper storage of mechanical fasteners	☒	P	Tbl 1.6		
7. Inspection Tasks During Mechanical Fastening					
a. Observe fastener spacing and position	☒	P	Tbl 1.7		
b. Verify fasteners are installed in accordance with manufacturer's instructions	☒	P	Tbl 1.7		
8. Inspection Tasks After Mechanical Fastening					
a. Check spacing, type and installation of support fasteners	☒	C	Tbl 1.8		

b. Check spacing, type, and installation of sidelap fasteners	☒	C	Tbl 1.8		
c. Check spacing, type, and installation of pe-rimeter fasteners	☒	C	Tbl 1.8		
d. Verify repair activities	☒	C	Tbl 1.8		
9. Document acceptance or rejection of deck & deck accessories for all phases of construction	☒	C	Tbls 1.1 thru 1.8		

Schedule of Special Inspection Services
Open-Web Steel Joists and Joist Girders

Inspection Task	T R	F	Reference for Cri-		A
			Sta	NCBC	
1. Fabricator Certification / Verification of Quality Control Procedures					
a. Verify fabricator qualifications	☒	C		1704. 2.5.1	
b. Collect certificate of compliance from steel joist producer at completion of manufacture	☒	C		1704. 5, 2207. 5	
2. Observe bolted and welded joist end con-nections	☒	P	SJI-K 5.3, 5.6, SJI-LH/ DLH 104 .4, 104 .7, SJI-JG 100 4.4, 100 4.6, SJI-CJ 104 .4, 104 .7	Table (Tbl) 1705. 2.3	

3. Verify size, spacing and connection of standard horizontal and diagonal bridging	☒	P	SJI-K 5.4, SJI-LH/DLH 104.5, SJI-JG 100 4.5, 100 4.9, SJI-CJ 104.5	Tbl 1705. 2.3	
4. Verify size, spacing and connection of bridging that differs from the SJI specifications listed by Part 2207.1 of the NCBC	☒	P		Tbl 1705. 2.3	

Schedule of Special Inspection Services

Concrete Construction

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			Standard[a]	NCBC	
1. Inspect reinforcement, including prestressing tendons, and verify placement	☒	P	ACI Ch.20, 25.2, 25.3, 26.6.1-26.6.3	1908.4	
2. Reinforcing Bar Welding:			AWS D1.4		
e. Verify weldability of reinforcing bars other than ASTM A706 and collect reports	☐	P	ACI 26.6.4	1704.5	
f. Inspect single-pass fillet welds ≤ 5/16"	☐	P	ACI 26.6.4		
g. Inspect all welds other than single-pass fillet welds ≤ 5/16"	☐	C	ACI 26.6.4		
3. Concrete Anchors:					
a. Inspect anchors cast in concrete	☒	P	ACI 17.8.2		
b. Inspect adhesive anchors installed in hardened concrete with horizontally or upwardly inclined orientations that resist sustained tension loads	☒	C	ACI 17.8.2.4		
c. Inspect adhesive anchors installed in hardened concrete with orientations different from Item 3.b	☒	P	ACI 17.8.2		
d. Inspect mechanical anchors installed in hardened concrete	☒	P	ACI 17.8.2		

4. Collect mix designs and verify the correct mix used during installation	☒	P	ACI Ch19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3	
5. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete	☒	C	ASTM C172, ASTM C31, ACI 26.4, 26.12	1908.10	
6. Inspect concrete placement for proper application techniques	☒	C	ACI 26.5	1908.6, 1908.7, 1908.8	
7. Collect reports of preconstruction tests for shotcrete when preconstruction tests are required by NCBC Section 1908.4	☐	C		1704.5, 1908.5	
8. Verify maintenance of specified curing temperature and techniques	☒	P	ACI 26.5.3-26.5.5	1908.9	
9. Inspections for prestressed concrete					
a. Observe application of prestressing force	☐	C	ACI 26.10		
b. Inspect grouting of bonded prestressing tendons	☐	C	ACI 26.10		
10. Verify concrete strength prior to stressing of PT tendons and prior to removal of shores and forms from PT & mild beams and structural slabs	☐	P	ACI 26.11.2		
11. Inspect erection of precast members	☐	P	ACI 26.8		

12. Inspect formwork for shape, location and dimensions of the concrete member being formed	☒	P	ACI 26.11.1.2(b)		
13. Collect mill test reports for ASTM A615 rebar used by SFRS special moment frames, special structural walls or coupling beams	☐	C	ACI 20.2.2.5	1704.5	

a. References to "ACI" in this table are to the ACI 318-14.

Schedule of Special Inspection Services

Masonry – Level C

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			TMS 402[a]	TMS 602[a]	
1. Test & verify f'm & f'AAC prior to construction & for every 5,000 square feet during construction	☐	C	Table (Tbl) 3.1.3	Art. 1.5	
2. Test & verify proportions of materials in premixed / preblended mortar, prestressing grout, and grout other than self-consolidating,	☐	C	Tbl 3.1.3		

as delivered to site					
3. Test & verify slump flow & visual stability index as delivered to site for self-consolidating grout	☐	C	Tbl 3.1.3	Art. 1.5B.1.b.3	
4. Verify compliance with the approved submittals	☐	P	Tbl 3.1.3	Art. 1.5	
5. Verify that the following are in compliance:					
a. Proportions of site-mixed mortar, grout and prestressing grout for bonded tendons	☐	P		Art. 2.1, 2.6A, 2.6B, 2.6C, 2.4G.1.b	
b. Grade, type, & size of reinforcement & anchor	☐	P	Sec 6.1	Art. 2.4, 3.4	

bolts, & prestress-ing ten-dons & anchorage					
c. Placement of ma-sonry units and construc-tion of mortar joints	☐	P		Art. 3.3B	
d. Placement of rein-forcement, connect-ors, and prestress-ing ten-dons and anchor-ages	☐	C	Sec 6.1, 6.2.1, 6.2.6, 6.2.7	Art. 3.2E, 3.4, 3.6A	
e. Grout space is clean, and cleanouts provided when re-quired	☐	C		Art. 3.2D, 3.2F	
f. Placement of grout and pre-stressing grout for bonded tendons	☐	C		Art. 3.5, 3.6C	
g. Size and location of structural elements	☐	P		Art. 3.3F	
h. Type, size, and loca-tion of an-chors in-cluding other de-	☐	C	Sec. 1.2.1(e), 6.1.4.3, 6.2.1		

tails of anchorage of masonry to structural members, frames, or other construction					
i. Welding of reinforcement	☐	C	Sec 8.1.6.7.2, 9.3.3.4(c), 11.3.3.4(b)		
j. Preparation, construction, and protection of masonry during cold weather (temperature < 40ºF) or hot weather (temperature > 90ºF)	☐	P		Art. 1.8C, 1.8D	
k. Application and measurement of prestressing force	☐	C		Art. 3.6B	
l. Placement of AAC masonry units and construction of thin-bed mortar joints	☐	C		Art. 3.3B.9, 3.3F.1.b	
m. Properties of thin-bed mortar	☐	C		Art. 2.1C.1	

for AAC masonry					
6. Observe preparation of grout specimens, mortar specimens, and or prisms	☐	C		Art. 1.4B.2.a.3, 1.4B.2.b.3, 1.4B.2.c.3, 1.4B.3, 1.4B.4	

a. References to "TMS402" in this table are to the TMS402/ACI530/ASCE5-13. References to "TMS602" are to TMS602/ACI530.1/ASCE6-13.

Schedule of Special Inspection Services

Soils

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agents
			Standard	NCBC	
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity	☒	P		1705.6	
2. Verify excavations extend to proper depth and have reached the correct soil material	☒	P		1705.6	
3. Perform classification and testing of compacted fill materials	☒	P		1705.6	
4. Verify that materials used, densities, lift thickness and procedures used during placement and compaction of compacted fill are in accordance	☒	C		1705.6	

with the approved soils report and the construction documents					
5. Prior to placement of compacted fill, verify that the subgrade has been prepared in accordance with the approved soils report and the construction documents	☒	P		1705.6	

Schedule of Special Inspection Services

Cast-in-Place Deep Foundations [a]

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agents
			Standard	NCBC	
1. Observe drilling operations and maintain complete and accurate records	☐	C		1705.8	
2. Verify deep foundation materials comply with the construction documents	☐	C		1705.8	
3. Verify pile placement, location, plumbness, diameters, bell diameter (if applicable), lengths, rock embedment, end-bearing strata capacity, and anomalies	☐	C		1705.8	
4. Record concrete or grout volumes	☐	C		1705.8	

a. For concrete elements and concrete-filled elements, perform additional inspections in accordance with Section 1705.3 of the North Carolina Building Code and the applicable Schedules included herein

Schedule of Special Inspection Services

Sprayed Fire-Resistant Materials [a]

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			Stand-ard	NCBC	
1. Prior to the application of sprayed on fire resistant materials, verify structural member surfaces are prepared in accordance with the approved fire-resistance design and the written instructions of the approved manufacturer	☒	P		1705.14.2	
2. During the application of sprayed on fire resistant materials, verify that the following are in compliance:					
a. Substrate has minimum ambient temperature before and after application as specified by the fire resistance design and approved manufacturer's	☒	P		1705.14.3	

written instructions					
b. Work area properly ventilated during and after application				1705.14.3	
c. Thickness of sprayed on material conforms with the approved fire resistance design and NCBC minimums	☒	P		1705.14.4, 1705.14.4.4, 1705.14.4.5, 1705.14.4.6, 1705.14.4.7, 1705.14.4.8, 1705.14.4.9	
d. The density of sprayed on materials is not less than the requirements of the approved fire-resistance design	☒	P		1705.14.5	
e. The cohesive / adhesive bond strength is not less than 150 pounds per square foot	☒	P		1705.14.6	

a. Inspections shall be performed after the rough installation of electrical, automatic sprinkler, mechanical and plumbing systems, and suspension systems for ceilings.

Schedule of Special Inspection Services
Fire-resistant Penetrations and Joints [a]

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			Standard	NCBC	
1. Inspect through-penetration firestop	☒	P		1705.17.1, 714.3.1.2	

systems at fire walls, fire barriers, smoke barriers and fire partition walls in accordance with ASTM E2174					
2. Inspect penetration firestop systems at penetrations through membranes that are part of a horizontal assembly in accordance with ASTM E2174	☒	P		1705.17.1, 714.4.2	
3. Inspect fire-resistant joint systems in accordance with ASTM 2393	☒	P		1705.17.2, 715.3, 715.4	

a. The inspection of fire-resistant penetrations and joints applies only to high-rise buildings or buildings assigned to Risk Category III or IV.

Schedule of Special Inspection Services
Retaining Walls Exceeding 5 Feet a b c d

Inspection Task	Task Req'd	Freq(a)	Reference for Criteria		Agent
			Standard	NCBC	
1. Foundation support system is adequate for the intended site conditions	☒	P		1807.2.5.1	
2. Verify that retaining wall materials and installations are in compliance with	☒	P		1807.2.5.2	

the construction documents					
3. Verify that actual soil conditions are similar to those anticipated by the approved engineered design	☒	P		1807.2.5.3	
4. Examination of backfill materials for compliance with the approved specifications	☒	P		1807.2.5.4	
5. Confirm that all subsoil drainage piping is undamaged, drains freely to the designated outlet or structure, and has been installed per the approved engineered design	☒	P		1807.2.5.4	

a. All retaining walls exceeding 5 feet in height require special inspections.
b. For concrete retaining walls and footings, perform additional inspections in accordance with Section 1705.3 of the North Carolina Building Code and the applicable Schedules included herein
c. For masonry retaining walls, perform additional inspections in accordance with Section 1705.4 of the North Carolina Building Code and the applicable Schedules included herein
d. For soils, perform additional inspections in accordance with Section 1705.6 of the North Carolina Building Code and the applicable Schedules included herein

Schedule of Special Inspection Services
Smoke Control

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			Stand-ard	NCBC	
1. During erection of ductwork and prior to concealment, perform leakage testing and record device location(s)	☒	P		1705.18.1.1	
2. Upon completion of smoke control system, perform pressure difference testing, flow measurements, and detection and control verification	☒	P		1705.18.1.2	

Schedule of Special Inspection Services

Special Inspections for Seismic Resistance

Inspection Task	Task Req'd	Freq	Reference for Criteria		Agent
			Stand-ard	NCBC	
1. Prior to any work taking place, each contractor responsible for the construction of a seismic-resisting system or component shall submit a written statement of contractor responsibility	☒	C		1704.4	
2. Structural Steel (per AISC 341-10 Chapter J)	☒	O/C		1705.12.1	
3. Structural Wood					
a. Verify field gluing operations of elements of the seismic force-resisting system (SFRS)	☐	C		1705.12.2.1	
b. Inspect nailing, bolting, anchoring & other fastening at elements of SFRS	☐	P		1705.12.2.2	

3. Cold-Formed Steel Light Frame Construction					
a. Verify welding operations of elements of the SFRS	☐	P		1705.12.3.1	
b. Inspect screw attachment, bolting, anchoring, & fastening used by SFRS	☐	P		1705.12.3.2	
c. Inspect special bolted moment frames	☐	P		1705.12.9	
5. Verify erection & fastening of exterior cladding, nonbearing walls and veneer	☒	P		1705.12.5	
6. Confirm anchorage of access floors	☐	P		1705.12.5.1	
7. Confirm anchorage of storage racks	☐	P		1705.12.7	
8. Collect certificates of compliance for qualifying equipment, supports, attachments & components;	☒	C	ASCE7 13.2.2, 13.2.1	1705.12.4, 1705.13.2	

verify correctness of labels & installation					
9. Plumbing, Mechanical, Electrical Components					
a. Verify anchorage of elec. equip for emergency & standby power systems	☒	P		1705.12.6	
b. Verify installation & anchorage of pipe & duct systems carrying hazardous materials & associated mech units	☒	P		1705.12.6	
c. Confirm the installation & anchorage of vibration isolation systems with nominal clearances ≤¼"	☒	P		1705.12.6	

d. Inspect & test seis-mic iso-lation systems at seis-mic iso-lated structures	☐	P	ASCE7 17.8	1705.12.8, 1705.13.4	

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PART 1 - GENERAL

1.1 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," "approved," "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. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

J. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

K. "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.

1.2 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 must 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 and make them available on request.

E. Abbreviations and Acronyms for 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.

ADAAG	Americans with Disabilities Act (ADA)
AGC	Associated General Contractors of America (The)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASTM	American Society for Testing and Materials International
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
SMCNA	Sheet Metal and Air Conditioning Contractors' National Association
TCNA	Tile Council of North America, Inc.
UL	Underwriters Laboratories, Inc.

1.3 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 indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

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.

CABO	Council of American Building Officials (See ICC)
IAPMO	International Association of Plumbing and Mechanical Officials (The)
ICBO	International Conference of Building Officials
ICC	International Code Council, Inc. (Formerly: CABO - Council of American Building Officials)
SBCCI	Southern Building Code Congress International, Inc.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:

1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Division 01 Section "Execution" for progress cleaning requirements.
4. Divisions 02 through 33 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 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.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

1.5 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

A. 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.

1.7 PROJECT CONDITIONS

A. 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.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber and Plywood: Comply with requirements in Division 06 Section "Miscellaneous Carpentry."

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. 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 15 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot square tack board.
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 at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC 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 for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
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.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating: Provide temporary heating 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 that will not have a harmful effect on completed installations or elements being installed.

F. 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 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.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
   2. Install lighting for Project identification sign.

I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
   1. Provide additional telephone lines for the following:
      a. Provide a dedicated telephone line for each facsimile machine and computer in each 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 superintendent with cellular telephone or portable two-way radio for use when away from field office.

J. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities.
   1. Provide DSL in primary field office with wireless access for guests.

3.2 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
   2. 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.
   3. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

B. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
   1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated on Drawings.
   2. Provide temporary, directional signs for construction personnel and visitors.
   3. Maintain and touchup signs so they are legible at all times.

C. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.3 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.

1. Comply with work restrictions specified in Division 01 Section "Summary."

B. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and 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.

C. 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.

D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

E. 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, insulate temporary enclosures.

F. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -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.
4. 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.

3.4 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.

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.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. 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 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 specified in Division 01 Section "Closeout Procedures."

END OF SECTION 01 50 00

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for 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 01 Section "References" for applicable industry standards for products specified.
2. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
3. Divisions 02 through 33 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 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.

1.3 SUBMITTALS

A. Product List: Submit a list, in tabular from, 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. Completed List: Within 60 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.

4. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product 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 to comply with the Contract Documents.

B. Substitution Requests: Submit three copies of each request for consideration. Identify 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 provided in this project manual.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified material or product cannot be provided.
      b. Coordination information, including a list of changes or modifications 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 substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.
      f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
      g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
      h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction, where available for type of material proposed.
      i. Detailed comparison of Contractor's Construction Schedule using proposed substitution 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 lack of availability or delays in delivery.
      j. Cost information, including a proposal of change, if any, in the Contract Sum.
      k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
      l. 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 7 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 7 days of receipt of additional information or documentation, whichever is later.
      a. Form of Acceptance: Change Order.
      b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product

request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
   a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
   b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.4 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.

1.5 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.

B. Delivery and Handling:
   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.

C. Storage:
   1. Store products to allow for inspection and measurement of quantity or counting of units.
   2. Store materials in a manner that will not endanger Project structure.
   3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Store cementitious products and materials on elevated platforms.
   5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
   6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   7. Protect stored products from damage and liquids from freezing.

D. Material Moisture and Mold Control: Comply with recommendations contained in Associated General Contractors (AGC) document "Managing the Risk of Mold in the Construction of Buildings." Prepare and submit plan for protecting materials from water damage, including the following:
   1. Indicate delivery, checking and storage operations affected by water damage control efforts.
   2. Indicate procedures for protecting porous materials from water damage, and how damaged materials will be handled.
   3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet work has dried sufficiently to permit installation of related finish materials.
   4. Describe protocol for dealing with large and unexpected water intrusion into completed portions of building. Indicate procedures for investigation of cause and effects, and methods for dealing with both.

1.6 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: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. 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.

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. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
   3. Refer to Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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 "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
   1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
   2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
   3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
   4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
   5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide 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 Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of 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 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, density, 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, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Requests for substitution following award of contract must comply with requirements of this article and are restricted to those necessitated by the following circumstances:
    1. Specified product is no longer available for purchase.
    2. Specified product is not available within schedule requirements of project.
    3. Specified product is not compatible with other product approved for project.
    4. Specified warranty is not available.

B. Timing: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

C. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied and so certified by Contractor. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
    1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    2. Requested substitution does not require extensive revisions to the Contract Documents.
    3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    4. Substitution request is fully documented and properly submitted.

5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. 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.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product 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:
   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

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Construction layout.
   2. General installation of products.
   3. Coordination of Owner-installed products (if any).
   4. Progress cleaning.
   5. Starting and adjusting.
   6. Protection of installed construction.
   7. Correction of the Work.

B. Related Sections include the following:
   1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
   2. Division 01 Section "Submittal Procedures" for submitting surveys.
   3. 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.

1.3 SUBMITTALS

A. Landfill Receipts: If hazardous waste is encountered, submit copy of receipts issued by a landfill facility licensed to accept hazardous materials for hazardous waste disposal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of utilities and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
   1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: 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; and underground electrical services.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: 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. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
      a. Description of the Work.
      b. List of detrimental conditions, including substrates.

c. List of unacceptable installation tolerances.
d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 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. 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.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 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 dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6. 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 invert elevations.

D. 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.

E. 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.

3.4 FIELD ENGINEERING

A. 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.

B. 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.

C. Final Property Survey: 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."

3.5 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 8 feet(2.4 m) in spaces without a suspended ceiling.

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. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. 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.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
   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.

H. 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.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS (IF ANY)

A. Site Access: Provide access to Project site for Owner's construction forces.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.

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 forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. 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 materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

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: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

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.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 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.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Divisions 02 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 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 surfaces to original conditions after installation of other Work.

1.4 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 In-Place 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. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems 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.

1.5 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. Miscellaneous Elements: Do not cut and patch miscellaneous 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. Miscellaneous elements include the following:

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.

C. 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.

D. 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.

1.6 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

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials 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 match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 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 in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. 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.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. 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 or prevent interruption to occupied areas.

3.3 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 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. 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 as small as possible, neatly to 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 32 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.
   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.
      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, 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 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.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 29

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for the following:
   1. Recycling nonhazardous demolition and construction waste.
   2. Disposing of nonhazardous demolition and construction waste.

B. Related Sections include the following:
   1. Division 01 Section "Temporary Facilities and Controls" for environmental-protection measures during construction, and location of waste containers at Project site.
   2. Division 02 Section "Selective Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
   3. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

1.3 PERFORMANCE GOALS

A. General: Develop waste management plan that results in end-of-Project rates for recycling of 75 percent by weight of total waste generated by the Work.

B. Recycle Goals: Owner's goal is to recycle as much nonhazardous demolition and construction waste as possible including the following materials:
   1. Demolition Waste:
      a. Asphaltic concrete paving.
      b. Concrete.
      c. Concrete reinforcing steel.
   2. Construction Waste:
      a. Site-clearing waste.
      b. Masonry and CMU.
      c. Lumber.
      d. Wood sheet materials.
      e. Wood trim.
      f. Metals.
      g. Roofing.
      h. Insulation.
      i. Carpet and pad.
      j. Gypsum board.
      k. Piping.
      l. Electrical conduit.
      m. Packaging: Regardless of recycle goal indicated above, recycle 100 percent of the following uncontaminated packaging materials:
         1) Paper.
         2) Cardboard.
         3) Boxes.

4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

1.4 SUBMITTALS

A. Waste Management Plan: Submit 3 copies of plan within 30 days of date established for the Notice to Proceed.

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include separate reports for demolition and construction waste. Include the following information:
   1. Material category.
   2. Generation point of waste.
   3. Total quantity of waste in tons.
   4. Quantity of waste recycled, both estimated and actual in tons.
   5. Total quantity of waste recovered (recycled) in tons.
   6. Total quantity of waste recovered (recycled) as a percentage of total waste.

C. Waste Reduction Calculations: Before request for Substantial Completion, submit 3 copies of calculated end-of-Project rates for recycling and disposal as a percentage of total waste generated by the Work.

D. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

E. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Qualification Data: For Waste Management Coordinator.

G. 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.

1.5 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
   1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
   2. Review requirements for documenting quantities of each type of waste and its disposition.
   3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
   4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
   5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste.

Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be recycled or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
   1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
   2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
   3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
   1. Total quantity of waste.
   2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
   3. Total cost of disposal (with no waste management).
   4. Revenue from recycled materials.
   5. Savings in hauling and tipping fees by donating materials.
   6. Savings in hauling and tipping fees that are avoided.
   7. Handling and transportation costs. Include cost of collection containers for each type of waste.
   8. Net additional cost or net savings from waste management plan.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Architect. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
   1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
   1. Distribute waste management plan to everyone concerned within three days of submittal return.
   2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for recycling and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Designate and label specific areas on Project site necessary for separating materials that are to be recycled.

2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    a. Inspect containers and bins for contamination and remove contaminated materials if found.
2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Grind asphalt to maximum 1-1/2-inch size.

B. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.
C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 01 74 19

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection procedures.
   2. Warranties.
   3. Final cleaning.

B. Related Sections include the following:
   1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
   2. Division 01 Section "Execution" for progress cleaning of Project site.
   3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
   4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   5. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
   6. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
   7. Make final changeover of permanent locks and deliver keys to Owner, if so required in Division 08 Section "Door Hardware." Advise Owner's personnel of changeover in security provisions.
   8. Complete startup testing of systems.
   9. Submit test/adjust/balance records.
   10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   11. Advise Owner of changeover in heat and other utilities.
   12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
   13. Complete final cleaning requirements, including touchup painting.
   14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. 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.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
   2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   4. Submit pest-control final inspection report and warranty.

B. Inspection: Submit a written request for final inspection for acceptance. 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.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies 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. Use CSI Form 14.1A.
   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.

1.5 WARRANTIES

A. Submittal Time: 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.

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 warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-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 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.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

PART 2 - PRODUCTS

2.1 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.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Provide instructors experienced in operation and maintenance procedures.
   2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
   3. Schedule training with Owner, through Architect, with at least seven days' advance notice.
   4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

3.2 FINAL CLEANING

A. General: Provide 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 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; shampoo 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. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates. Remove paint or other matter obscuring labels.
m. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction or if inspection indicates units are not in clean, like-new condition.
r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
s. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 77 00

PART 1 - GENERAL

1.1 SUMMARY

A. This 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. Maintenance manuals for the care and maintenance of products, materials, and finishes and systems and equipment.

1.2 SUBMITTALS

A. Initial Submittal: Submit 1 draft copy of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return one copy of draft and indicate whether general scope and content of manual are acceptable.

B. Final Submittal: Submit 1 copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
   1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.3 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: 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."

2.2 MANUALS, GENERAL

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. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. 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, address, and telephone number of Contractor.
6. Name and address of Architect.
7. 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. 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.
1. Binders: Heavy-duty, 3-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. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. 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 diskettes 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.

2.3 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.

2.4 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.
2. Performance and design criteria if Contractor is 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.
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.

2.5 PRODUCT MAINTENANCE MANUAL

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.

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. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

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.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed 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 videotape, 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.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 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. 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.

D. 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."

E. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
   1. Record Drawings.
   2. Record Specifications.
   3. Record Product Data.

1.2 SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit one set(s) of marked-up Record Prints.
B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
C. Record Product Data: Submit one copy of each Product Data submittal.
   1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
   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 prepare the 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 understandable drawing technique.
      c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
   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 or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

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. 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.

C. 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. Identification: As follows:
a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

2.2 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.

2.3 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.

2.4 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.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the 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

PART 1 - GENERAL

1.1 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.

1.2 SUMMARY

A. This 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 videotapes.

B. Related Sections include the following:
   1. Division 01 Section "Project Management and Coordination" for requirements for pre-instruction conferences.
   2. Divisions 02 through 33 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including 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. At completion of training, submit one complete training manual(s) for Owner's use.

1.4 QUALITY ASSURANCE

A. Pre-instruction 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.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. 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.

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 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, through Architect, with at least seven days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, a written, or a demonstration performance-based test, as required by Owner.

E. 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.

END OF SECTION 01 79 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Demolition and removal of selected portions of building or structure.

1.3 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. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Predemolition Photographs or Video: Submit before Work begins.

1.6 CLOSEOUT SUBMITTALS

A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.7 QUALITY ASSURANCE

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. Storage or sale of removed items or materials on-site is not permitted.

E. 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.

1.8 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.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. 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.

D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
   1. Comply with requirements specified in Division 01 Section "Photographic Documentation."

3.2 PREPARATION

A. 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. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.3 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated on Drawings. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. 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.
   2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   3. 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 portable fire-suppression devices during flame-cutting operations.
   4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   5. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."

B. 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.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent 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. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.5 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.

3.6 DEMOLITION LEGEND

A. Refer to Drawings for General Demolition Notes and Demolition Legend.

END OF SECTION 02 41 19

PART 1 - GENERAL

1.1 GENERAL

Work of this Section shall conform to requirements of Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections.

1.2 SCOPE

Provide all labor, materials, equipment, services and transportation for formwork and related accessories required to complete all cast-in-place concrete work as shown on Drawings, as specified herein, and as required by the job conditions.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

Submittals	Division 1
Quality Control	Division 1
Concrete Reinforcement and Embedded Assemblies	Section 03 20 00
Cast-in-Place Concrete	Section 03 30 00
Thermal and Moisture Protection	Division 7

1.4 CODES AND STANDARDS

A. Building Code: Concrete work shall conform to the requirements of the Building Code identified on the Structural General Notes, and OSHA requirements, except where more stringent conditions or criteria occur in the standards referenced below and on the Drawings.

B. Standards:

1. ACI 117 – Standard Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 237 – Self Consolidating Concrete.
3. ACI 301 –Specifications for Structural Concrete.
4. ACI 318 – Building Code Requirements for Structural Concrete and Commentary.
5. ACI 347 – Guide to Formwork for Concrete.
6. ACI 347.2R – Guide for Shoring/Reshoring of Concrete Multistory Buildings C. Definitions:

1. See Section 03 30 00.

1.5 CONTRACTOR QUALIFICATIONS

A. The work of this section shall be performed by a company specializing in the type of concrete formwork required for this Project, with a minimum of 10 years of documented successful experience and shall be performed by skilled workers thoroughly experienced in the necessary crafts.

B. Contractor’s Testing Agency Services: Required as specified in Division 1, and herein.

C. Materials and installed work may require testing and retesting at any time during progress of work, as directed by Design Professionals. Tests, including retesting of rejected materials for installed work will be done at Contractor's expense.

1.6 SUBMITTALS

A. Required Submittals - Where the SUBMITTALS section of this Specification is in conflict with Division 1 Submittals, the more stringent requirements for the Contractor apply. Required submittal items are listed here; see below for detailed requirements. Do not submit items not requested.

(1) Submittal Schedule
(2) Formwork Shop Drawings
(3) Shoring/Reshoring Calculations
(4) Product Data
(5) Samples
(6) Compatibility Certification
(7) Hazardous Materials Notification

2. Formwork Shop Drawings:

Submit for Record: Formwork shop drawings sealed and signed by a registered Design Professional licensed to practice as a Professional Engineer in the state where the project is located. Shop drawings shall clearly indicate but not be limited to the following:

1. Size, type and quality of form materials including conditions at tops and ends of walls. (If wood is used, indicate species.)
2. Form construction indicating structural stability and jointing including special form joints or reveals required by Contract Documents
3. Location and pattern of form tie placement, and other items that affect the appearance of concrete that will remain exposed to view.
4. Form finish clearly indicating proper locations and full coordination with concrete finishes required by Contract Documents.
5. Layout, procedures, and sequencing of shoring and reshoring that correlates with the information contained in the shoring/reshoring calculations described below.
6. Comprehensive (a single drawing per area/element) layout drawings showing openings in structural members, including floor slab, shearwalls, columns and beams. Drawings shall consolidate the work of all trades and shall be coordinated by the Contractor. Submit with or prior to reinforcement submittal for same element/area.

b) Submit for Review

1. Location of proposed construction joints in walls, floors, slabs, beams per Specification Section 03 30 00.

3. Shoring/Reshoring Calculations: Submit for Record. Calculations sealed and signed by a registered Design Professional licensed to practice as a Professional Engineer in the state where the project is located. Calculations shall clearly address but not be limited to the following:
   a) Shoring removal and reshoring installation procedure including timing and sequencing.
   b) Concrete age and strength at the time of each shoring/reshoring operation.

c) Description of construction loads assumed including concrete, formwork, and construction live load in accordance with ACI 347.
d) A description of the distribution of construction loads between the shored/reshored levels.
e) The total construction load imposed on all levels supporting shoring/reshoring at each stage of the shoring/reshoring cycle.
f) A written statement by the Professional Engineer that the total construction load imposed on any level supporting shoring/reshoring, at all stages of the shoring/reshoring cycle, accounting for concrete age and relative strength at time of loading, meets the requirement of Section 3.2.

4. Product Data: Submit copies of manufacturers' product data and installation instructions for proprietary materials used in exposed concrete work, including form liners, release agents, manufactured form systems, ties, and accessories.
5. Samples: At request of Architect, submit samples of form ties and spreaders.
6. Compatibility Certification: Submit for record a written statement certifying that form release agent used is compatible with subsequent architectural finish materials applied to concrete surfaces. Submit along with manufacturer's data.
7. Hazardous Materials Notification: Submit for record. In the event no product or material is available that does not contain hazardous materials as determined by the Owner, a "Material Safety Data Sheet" (MSDS) equivalent to OSHA Form 20 shall be submitted for that proposed product or material prior to installation.

B. Submittal Process: See Section 03 30 00

C. SER Submittal Review: See Section 03 30 00

D. Substitution Request: See Section 03 30 00

E. Request for Information (RFI): See Section 03 30 00

1.7 FORMWORK DESIGN

A. Design of Formwork, Shoring/Reshoring, and its removal is the Contractor’s responsibility.

B. Design, erect, support, brace and maintain formwork so that it will safely support vertical and lateral loads per SEI/ASCE 37-02 that might be applied, until such loads can be supported by the concrete structure.

C. Design Requirements:

1. Forms shall be designed for fabrication and erection in accordance with Design Professionals’ requirements and recommendations of ACI 301, 318 and 347.
2. Design formwork in a manner such that the total construction load does not at any time exceed the total design load of new or existing construction and accounts for concrete age and relative strength at time of loading. See Section 3.2 for shoring/reshoring requirements.
3. Design formwork for loads and lateral pressures outlined in Section 2.2, ACI 347, and wind and seismic loads as specified by SEI/ASCE 37-02 unless otherwise controlled by local building code.
4. Design formwork to include loads imposed during construction, including weight of construction equipment, concrete mix, height of concrete drop, rate of filling of formwork, vibrator frequency, ambient temperature, foundation pressures, lateral stability, temporary imbalance or discontinuity of building components, and other factors pertinent to safety of structure during construction.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with General Conditions and Division 1, including the following:

1. Store forms and form materials clear of ground and protect from damage.

1.9 QUALITY ASSURANCE BY OWNER'S TESTING AGENCY

A. Field Quality Assurance General: The Owner's Testing Agency shall test and inspect concrete formwork as Work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such a defect is discovered nor shall it obligate Design Professionals for final acceptance.

B. Testing Agency shall provide qualified personnel at site to inspect formwork using the latest Contract Documents and approved shop drawings as follows:

1. Prior to placement of reinforcement, inspect formwork for grade, quality of material, absence of foreign matter, and other imperfections that might affect suitability of concrete placement and tolerances stated herein.
2. Inspect forms for location, configuration, compliance with specified tolerances, block outs, camber, shoring ties, seal of form joints and compliance with Contract Documents.
3. Verify condition of bond surfaces, locations and sizes of all accessories, embedment items, and anchorage for prevention of displacement.
4. Verify proper use/application of form release agents.
5. Inspect concrete surfaces immediately after removal of formwork and prior to any patching or repair work.

C. Owner's Testing Agency shall submit inspection, observation, and/or test reports to the Owner and Design Professionals, as required herein and shall provide an evaluation statement in each report stating whether or not concrete formwork conforms to requirements of Specifications and Drawings and shall specifically note deviations therefrom.

D. Immediately report deficiencies to the Contractor, Owner and Design Professionals.

1.10 QUALITY CONTROL BY CONTRACTOR

See Section 03 30 00.

1.11 PERMITS AND WARRANTY

A. Permits: See Section 03 30 00.

B. Warranty: Comply with General Conditions, agreeing to repair or replace specified materials or Work that has failed within the warranty period. Failures include but are not limited to the following:

1. Discoloration of concrete scheduled to remain exposed to view.
2. Damage of concrete finishes caused by forms.
3. Damage of concrete caused by form stripping.
4. Non-compliance with form finishes required for designated architectural finishes.
5. Non-compatibility of form release agent with subsequent architectural finish materials applied to concrete surfaces.

6. Excessive and/or noticeable bowing in placed concrete members caused by deflection of formwork during concrete placement.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products of the manufacturers specified in this section establish the minimum functional, aesthetic and quality standards required for work of this section.

B. Substitutions: Comply with General Conditions using form in Division 1.

2.2 FORMWORK REQUIREMENTS A.

General Requirements:

1. Formwork shall meet construction safety regulations for locality in which this Project is located.
2. Forms shall be removable without impact, shock or damage to concrete surfaces, the structure and adjacent materials.
3. Forms shall be tight-fitting, designed and fabricated for required finishes and to withstand concrete weight and maintain tolerances as specified in ACI 117 for the following designations: (See architectural drawings for locations).
   a) Class A – For surfaces prominently exposed to public view where appearance is of special importance.
   b) Class B – Coarse-textured concrete-formed surfaces intended to receive plaster, stucco or wainscoting.
   c) Class D - Minimum quality surface where roughness is not objectionable, usually applied where surfaces will be concealed.
4. Furnish forms in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings, using form materials with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
5. Butt Joints: Shall be solid and complete with backup material to prevent leakage of cement paste.

B. Form Finishes for Exposed Surfaces:

1. Type: Straight, smooth, free of cement paste leaks at butt-joints, surface imperfections and other irregularities detrimental to appearance of finished concrete, fully coordinated with requirements for required finish material.
2. Form exposed areas of columns, beams, ledges, balcony fascias to achieve true alignment and level soffit of spandrel beams and concrete edges. All such areas must be sharp, straight and true to line and level. Spandrel beams and concrete canopies and ledges must have adequate shoring to prevent any visible amount of sag and sufficient bracing to prevent any lateral movement during construction.

2.3 FORM MATERIALS

A. General: Plywood, fiberglass, metal, metal-framed plywood faced, or other acceptable panel-type materials.

1. Provide materials with sufficient strength to prevent warping.

B. Plywood: Of species and grade suitable for intended use, sound undamaged sheets with clean true edges, minimum 5/8" (16mm) thick, complying with U.S. Product Standard PS-1.

1. Other Acceptable Sheet Materials: 14 gauge (2.0mm) sheet steel or fibrous glass reinforced resin.

C. Forms for Cylindrical Columns and Supports: Metal, glass-fiber reinforced plastic, or paper or fiber tubes that will produce smooth surfaces without joint indications.

1. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.

D. Chamfer for Form Corners:

1. Types: Chamfer strips of wood, metal, PVC or rubber fabricated to produce smooth form lines and tight edge joints, 3/4" (20mm) size, maximum possible lengths.
2. Required for all exposed corners of beam, walls and column forms. E. Form Ties:

1. Type: Factory-fabricated metal, adjustable length, designed to prevent form deflection and to prevent spalling concrete upon removal.
2. Ties used for architecturally exposed concrete shall be galvanized.
3. Ties shall not leave metal closer than 1-1/2" (40mm) to exposed surface.
4. When removed, ties shall not leave holes larger than 1" (25mm) diameter in concrete surface.
5. Removable Ties: Use type with tapered cones, 1" (25mm) outside diameter, for concrete walls which will remain exposed to view and scheduled for architectural finishes.
6. Snap-Off Ties: Use for concrete walls below grade and walls which will not remain exposed to view and are not scheduled for architectural finishes.
7. Wire Ties: Not acceptable.

F. Nails, Spikes, Lag Bolts, Thru-Bolts, Anchorages:

1. Type: Of size, strength and quality to meet the required quality of formwork. G. Form Release Agent:

1. Type: Commercial formulation form release agent of non-emulsifiable type which will not bond with, stain, or adversely affect concrete surfaces. Form release agent shall not impair subsequent treatment of concrete surfaces requiring bond or adhesion, or impede the wetting of surfaces to be cured with water or curing compounds. Form release agent shall be compatible with subsequent architectural finish materials applied to concrete surfaces. Apply in compliance with manufacturers' instructions.
2. Form release agent shall meet, at a minimum, all federal and state requirements for volatile organic compounds (VOC's).
3. For Steel Forms: Non-staining rust-preventative type.

H. Reglets: Provide sheet metal reglets formed of same type and gauge as flashing metal, unless indicated otherwise on Drawings. Where resilient or elastomeric sheet flashing, or bituminous membranes are terminated in reglets, provide reglets of not less than 26 gauge (0.55mm) galvanized sheet metal. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

I. Coordinate with materials as specified in Section 03 20 00/Concrete Reinforcement and Embedded Assemblies.

PART 3 - EXECUTION

3.1 FORMWORK

A. General:

1. Inspect areas to receive formwork.
   a) Immediately report to Owner's Testing Agency and Design Professionals in writing the conditions that will adversely affect the Work.
2. Construct forms to sizes, shapes, lines, and dimensions shown on Contract Documents, and to obtain accurate alignment, location, grades, level and plumb work in finished structures.
3. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins, and to maintain alignment.
4. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, drips, bevels, chamfers, blocking, screeds, bulkheads, anchorages and inserts and other features required in the Work.
5. Comply with shop drawings, ACI 301, 318, 347 and Contract Documents.
6. Maintain formwork and finished work construction tolerances complying with ACI 301 and 117.
7. Provide shore and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof.
8. Erect forms for easy removal without hammering or prying against concrete surfaces.
9. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.
10. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only.
11. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.
12. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce smooth lines and tight edge joints.
13. Design, erect, support, brace and maintain formwork and shoring to support loads until such loads can be safely supported by the concrete structure.
14. Where specifically shown on the Contract Documents as monolithic, upturned beams, curbs and similar members in connection with slabs shall be formed so that they can be poured integrally with slabs. B. Concrete Accessories and Embedded Items:

1. Install into forms concrete accessories, sleeves, inserts, anchor bolts, anchorage devices and other miscellaneous embedded items furnished by other trades or that are required for other work that is attached to or supported by cast-in-place concrete.
   a) Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached.
2. Install reglets to receive top edge of foundation sheet waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated on drawings or required by other trades.
4. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces.
5. Coordinate with Section 03 20 00/Concrete Reinforcement and Embedded Assemblies.

6. Install accessories and embedded items straight, level, plumb and secure in place to prevent displacement by concrete placement. C. Temporary Openings:

1. Locate temporary openings in forms at inconspicuous locations.
2. For clean-outs and inspection before concrete placement, locate temporary openings where interior area of formwork would otherwise be inaccessible.
3. For cleaning and inspections, locate openings at bottom of forms to allow flushing water to drain.
4. Securely brace temporary openings and set tightly in forms to prevent loss of concrete.
5. Close temporary openings with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be noticeable on exposed concrete surfaces.

D. Provisions for Other Trades: Coordinate and provide openings in concrete formwork to accommodate work of other trades.

1. Determine size and location of openings, recesses, chases, offsets, openings, depressions, and curbs from information provided by trades requiring such items.
2. Accurately place and securely support items built into forms.

E. Cleaning:

1. Normal Conditions:
   a) Thoroughly clean forms and adjacent surfaces to receive concrete.
   b) Remove chips, wood, sawdust, dirt, standing water or other debris just before placing concrete.
   c) Flush with water or use compressed air to remove remaining foreign matter.
   d) Verify that water and debris can drain from forms through clean-out ports.
2. During Cold Weather:
   a) Remove ice and snow from within forms.
   b) Do not use de-icing salts.
   c) Do not use water to clean out completed forms, unless formwork and concrete construction will proceed within heated enclosure.
   d) Use compressed air or other means to remove foreign matter.

F. Form Release Agents

1. Before placing reinforcing steel and miscellaneous embedded items, coat contact surfaces of forms with an approved non-residual, low VOC form release agent in accordance with manufacturer's published instructions.
2. Do not allow release agent to accumulate in forms or come into contact with reinforcement or concrete against which fresh concrete will be placed. a) Coat steel forms with nonstaining, rust-preventative material.
3. Remove form release agent and residue from reinforcement or surfaces not requiring form coating. G. Before Placing Concrete:

1. Inspect and check completed formwork, shoring and bracing to ensure that work is in accordance with formwork requirements of this section and Contract Documents, and that supports, fastenings, wedges, ties, and parts are secure.
   a) Make necessary corrections or adjustment to formwork to meet tolerance requirements.

2. Retighten forms and bracing before concrete placement to prevent mortar leaks and maintain proper alignment.

3. Notify Owner's Testing Agency sufficiently in advance of placement of concrete to allow inspection of completed and cleaned forms. H. During Concrete Placement:

1. Maintain a check on formwork to ensure that forms, shoring, ties and other parts of formwork have not been disturbed by concrete placement methods or equipment.
2. Use positive means of adjustment as required for formwork settlement during concrete placing operations.

I. Camber:

1. Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete and construction loads.
2. Camber bottom forms where indicated on the drawings. Whenever forms are cambered, screeded levels for establishing top of concrete must be cambered to the same amount and to the same profiles such that scheduled depth of member is not reduced by lifting of forms. Check camber and adjust forms before initial set as required to maintain camber. J. Surface Defects:

1. Install forms that will not impair the texture of the concrete and are compatible with the specified finish type.

K. Formwork Loads on Grade

1. Where loads from formwork bear on grade, provide suitable load-spreading devices for adequate support and to minimize settlement. In no event shall frozen ground or soft ground be utilized directly as the supporting medium. L. Footings and Grade Beams:

1. Provide forms for footings and grade beams if soil or other conditions are such that earth trench forms are unsuitable.
2. When trench forms are used, provide an additional 1" (25mm) of concrete on each side of the minimum design profiles and dimensions indicated.

M. For slabs-on-grade, secure edge forms in such a manner as to not move under weight of construction loads, construction and finishing equipment, or workers.

3.2 SHORES AND RESHORES

A. Comply with ACI 347.2R for shoring and reshoring in multistory construction, and as specified herein.

1. For non-post tensioned flat plate concrete structures of less than five supported levels, extend shoring/reshoring to ground.
2. For shoring/reshoring placed on mud sills, adjustments shall be made by contractor to account for ground settlement.
3. Locate shores/reshores such that the factored (ultimate) construction load imposed onto any slab or beam at any time during the construction cycle does not exceed 90% of the factored (ultimate) design load for that slab or beam, scaled down to reflect effect on capacity of lower concrete strength at time of loading.
4. Construction load shall include the weight of wet concrete, total weight of formwork and shoring/reshoring, and a minimum construction live load of 50 psf (2.5kPa) (increase if construction operations will produce higher loading). Design load includes self-weight of the slab, and superimposed dead and live loads as indicated on the drawings.

5. For comparison of construction loads to design loads, compare factored (ultimate) construction loads to factored (ultimate) design loads. Use the same load factors for the construction load that were used for the design of the slabs.

3.3 REMOVING FORMS

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F (10°C) for 12 hours after placing concrete, provided concrete is sufficiently hard to avoid damage by form-removal operations, and provided curing and protection operations are maintained after removal of formwork.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed until concrete has attained at least 75% of design compressive strength as proven by cylinder test. If stripping occurs before 3 days, 100% strength must be achieved.

1. Provide reshores as required per ACI 347.
2. Determine potential compressive strength of in-place concrete by testing fieldcured specimens representative of concrete location or members.

C. Remove formwork progressively using methods to prevent shock loads or unbalanced loads from being imposed on structure. Comply with ACI 347.

D. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against concrete surfaces.

E. Reshore structural members where required due to design requirements, construction requirements, or construction conditions.

1. Reshore on same day shoring and forms are removed.

F. Whenever formwork is removed during the curing period, the exposed concrete shall be cured per requirements of Section 03 30 00.

G. All wood formwork, including that used in void spaces, pockets and other similar places shall be removed.

H. Form tie holes shall be filled as per approved samples submitted to the Architect and Engineer.

I. The Contractor shall assume responsibility for all damage due to removal of the forms.

3.4 RE-USING FORMS

A. Before forms can be re-used, surfaces that will be in contact with freshly poured concrete must be thoroughly cleaned, damaged areas repaired, and projecting nails withdrawn.

1. Split, frayed, delaminated or otherwise damaged form-facing material will not be acceptable.
2. Apply new form release agent on re-used forms.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joints to avoid offsets.

C. Forms for exposed concrete may be reused only if the surfaces have not absorbed moisture and have not splintered, warped, discolored, stained, rusted or peeled, subject to acceptance by the Design Professionals. The Design Professionals reserve the right to

require the Contractor to remove and reconstruct such formwork as will produce subsequent areas that are acceptable. Do not use "patched" forms for exposed concrete surfaces, unless approved by the Design Professionals.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:
   1. Concrete masonry units.
   2. Mortar and grout.
   3. Masonry joint reinforcement.
   4. Ties and anchors.
   5. Miscellaneous masonry accessories.

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.

B. Determine net-area compressive strength (f'_m) of masonry by testing masonry prisms according to ASTM C 1314.

1.5 SUBMITTALS

A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.

B. Shop Drawings: Show fabrication and installation details for the following:
   1. Masonry Units: Show sizes, profiles, and coursing.
   2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
   3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection: For the following:
   1. Colored mortar Samples for each color required, showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project.

D. Samples for Verification: For each type and color of the following:
   1. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project**.**

E. Qualification Data: For testing agency.

F. 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.
   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.

G. 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.

H. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

I. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.6 QUALITY ASSURANCE

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, through one source from a 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 one manufacturer for each cementitious component and from one source or producer for each aggregate.

C. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

D. 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 mockups for each type of exposed unit masonry construction showing typical exterior wall in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.
      a. Include a sealant-filled joint at least 16 inches long in each exterior wall mockup.
      b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
      c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
      d. Include metal studs, sheathing, veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup.
   2. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
   3. Protect accepted mockups from the elements with weather-resistant membrane.
   4. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
      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.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".

1.7 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.

1.8 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.

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.

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.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.

PART 2 - PRODUCTS

2.1 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.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners, unless indicated as bullnose.

B. Concrete Masonry Units: ASTM C 90 and as follows:

1. Minimum Net Area Average Compressive Strength: Average of three units 1900 psi, individual unit 1700 PSI. Meets ASTM C 90 standard average of three units 1900 psi, individual unit 1700 psi.
2. Maximum Absorption: Absorption is less than 18 lbs/CF. Meets ASTM C 90 standard of 18/lbs/CF absorption rate.
3. Weight Classification: Units shall be lightweight, blended with expanded shale, clay or slate, produced by the rotary kiln process and shall conform to ASTM C331 and ASTM C33 shall be graded to assure consistent texture with total mix weight not more than 105 lbs/CF and not less than 90 lbs/CF. Meets ASTM C 90 standard for lightweight not more than 105 lbs/CF.
4. All units shall be free of organic impurities that will cause rusting, staining, or pop outs and shall contain no combustible material. All lightweight material to be manufactured by rotary

kiln process. The use of coal cinder aggregate/bottom ash or similar waste products will not be allowed.

5. The producer of the lightweight concrete masonry units shall furnish a letter of certification stating that all lightweight aggregate used in the manufacturer of the units was expanded shale, clay or slate produced by the rotary kiln process conforming to ASTM C331 and ASTM C330.
6. Size (Width): Manufactured to the following dimensions:
   a. 4 inches nominal; 3-5/8 inches actual.
   b. 8 inches nominal; 7-5/8 inches actual.
7. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.3 MORTAR AND GROUT 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 to match mortar in existing building.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

D. Masonry Cement: Not Permitted.

E. Mortar Cement: ASTM C 1329.

F. Colored Cement Product: Packaged blend made from portland cement and lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
   1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
   2. Pigments shall not exceed 10 percent of portland cement by weight.
   3. Pigments shall not exceed 5 percent of mortar cement by weight.
   4. Products: Subject to compliance with requirements, provide products by one of the following:
      a. Colored Portland Cement-Lime Mix:
         1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
         2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
         3) Lafarge North America Inc.; Eaglebond.
         4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
      b. Colored Mortar Cement:
         1) Lafarge North America Inc.; Magnolia Superbond Mortar Cement.

G. 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.
   3. Natural Color.
   4. White-Mortar Aggregates: Natural white sand or crushed white stone.

H. Aggregate for Grout: ASTM C 404.

I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
   1. Products: Subject to compliance with requirements, provide products by one of the following:
      a. Addiment Incorporated; Mortar Kick.
      b. Euclid Chemical Company (The); Accelguard 80.
      c. GCP Technologies, Inc. (formerly Grace); Morset.

J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

K. Water: Potable.

2.4 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.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side Rods: W2.8 or 0.188-inch diameter.
4. Wire Size for Cross Rods: W2.8 or 0.188-inch diameter.
5. Wire Size for Veneer Ties: W2.8 or 0.188-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.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

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 and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

E. Masonry Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.188-inch- diameter, hot-dip galvanized, carbon-steel continuous wire.

2.5 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
2. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
3. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.
4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. 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. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, stainless-steel wire.
2. Tie Section for Steel Frame: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.188-inch- diameter, hot-dip galvanized steel wire.

C. Partition Top anchors: 0.097-inch- thick metal plate with 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

2.6 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.

B. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

C. Postinstalled Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry 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 agency.

1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

2. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.7 EMBEDDED FLASHING MATERIALS

A. Provide prefabricated corners and end dams of same material and thickness as primary material and from the same flashing manufacturer.

B. Provide minimum 10-inch wide strips of same material under joints.

C. Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:

1. Copper-Laminated Flashing – Thru-Wall Flashing: 5-oz./sq. ft. copper sheet bonded with asphalt between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) Advanced Building Products Inc.; Copper Fabric Flashing.
      2) AFCO Products Inc.; Copper Fabric.
      3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
      4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
      5) Polytite Manufacturing Corp.; Copper Fabric Flashing.
      6) York Manufacturing, Inc.; York Copper Fabric Flashing.
2. Rubberized-Asphalt Flashing – Self-Adhered Flashing, where indicated: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) Advanced Building Products Inc.; Peel-N-Seal.
      2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
      3) GCP Applied Technologies, Inc. (formerly Grace); Perm-A-Barrier Wall Flashing.
      4) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
      5) Hohmann & Barnard, Inc., Dur-O-Wal Division; Dur-O-Barrier-44.
      6) Hohmann & Barnard, Inc.; Textroflash.
      7) Polyguard Products, Inc.; Polyguard 300.
      8) Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
      9) Williams Products, Inc.; Everlastic MF-40.

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.8 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 or urethane.

B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
2. PVC: ASTM D 2287, Type PVC-65406

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.9 MASONRY-CELL INSULATION

A. Insulation Fill (Foam Insulation): Two-component foamed insulation consisting of aqueous resin and foaming agent; containing no polyurethane, polystyrene, polyisocyanurate or petrochemicals;

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Core-Fill 500 Foam Insulation by Tailored Foam, Inc., Hickory, NC 28603;

b. Tripolymer Insulation by C.P. Chemical Co.
c. Polymaster Foam Insulation by Polymaster, Inc., Knoxville, TN.

B. Masonry Cell Foam Insulation: Injected, expansive foam, UL approved as component of fire-resistance-rated concrete masonry unit wall assembly, Class A rated per ASTM E-84. Products: Core-fill 500 by Tailored Chemical Products, Inc.

2.10 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.

B. 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.

1. Manufacturers: Subject to compliance with requirements, provide one of the following:
   Diedrich Technologies, Inc.
   a. EaCo Chem, Inc.
   b. ProSoCo, Inc.

2.11 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.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion 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 M.
2. For reinforced masonry, use Type S.
3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
4. For interior non-load-bearing partitions, Type O may be used instead of Type N.

C. Pigmented Mortar: Use colored cement product.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Match mortar in existing building.

D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Match mortar in existing building.

E. 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.

2.12 SOURCE QUALITY CONTROL

A. Owner may choose to 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. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
   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 to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.

C. 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.

D. 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.

E. 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.

3.3 LAYING MASONARY 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, and wet brick if required before laying fresh masonry.

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.

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.

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. At fire-rated partitions, treat joint between top of partition and underside of structure above.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and 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.

1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.5 MASONRY-CELL INSULATION

A. Install acoustical masonry foam by drilling and injecting concrete masonry assembly and completely filling all cores in wall. Comply with manufacturer’s installation recommendations. Patch wall to original condition.

3.6 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.
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.

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
   1. Provide an open space not less than 1/2 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
   2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
   3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing, concrete, and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:
   1. Fasten screw-attached and seismic 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. Embed connector sections and continuous wire in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
   3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
   4. Space anchors as indicated.

3.9 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:
   1. Install preformed control-joint gaskets designed to fit standard sash block.

C. Form expansion joints in brick made from clay or shale as follows:
   1. Form open joint full depth of brick 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. Provide horizontal, pressure-relieving joints by either leaving an air space or 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.

3.10 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.

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

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 multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe.
3. 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 and turn up not less than 2 inches to form end dams.
4. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
1. Use specified weep products specified in Part 2 to deter insects from entering weep holes.
2. Space weep holes 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.

3.12 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.

3.13 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.

B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:
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.

C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

E. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

F. Prism Test: For each type of construction provided, per ASTM C 1314 at 7 days and at 28 days.

3.14 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.
   1. Point mortar joints of existing building as required for a neat, uniform appearance.
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. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.15 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 "Earthwork."
   3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

END OF SECTION 04 20 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of structural steel work is shown on drawings, including schedules, notes, and details to show size/location of members, typical connections, and type of steel required.

B. Structural steel is that work defined in AISC "Code of Standard Practice" and as otherwise shown on drawings.

C. Miscellaneous metal fabrications are specified elsewhere in Division 5.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with all applicable provisions of state and local building and safety codes and all other codes referenced therein, other federal (OSHA) safety requirements, and other codes and standards referenced in this specification, except where more stringent requirements are indicated or specified herein.

1. AISC "Code of Standard Practice for Steel Buildings and Bridges", March 18, 2005 Edition except where superseded herein.
2. AISC 360-10 "Specifications for Structural Steel for Buildings", except as modified herein.
3. AISC 341-10 “Seismic Provisions for Structural Steel Buildings”, including “Supplement No. 1” dated 2005.
4. AISC "Specification for Structural Joints using ASTM A325 or A490 Bolts" approved by Research Council on Structural Connections of the Engineering Foundation, June 30, 2004.
5. AWS D1.1 "Structural Welding Code", current edition.
6. Appropriate specifications of American Society for Testing and Materials.
7. "Steel Structures Painting Manual", Volumes 1 and 2, Steel Structures Painting Council.
8. ASTM A6-91b "General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use".

B. Any material or operation specified by reference to published specification of a manufacturer shall comply with requirements of standards listed herein. In case of a conflict between referenced specifications and project specifications, project specifications shall govern.

C. If requested, furnish affidavit from manufacturer or fabricator certifying that materials or products delivered to job meet requirements specified. However, such certification shall not relieve Contractor from responsibility of complying with any added requirements specified herein.

D. AISC Code of Standard Practice: The following paragraphs are superseded as noted below to clearly affirm the responsibilities of the Contractor and Fabricator defined in these specifications. Where the AISC "Code of Standard Practice" (AISC Code) may be interpreted to relieve the Contractor or Fabricator of the responsibilities assigned or reasonably inferred as assigned to him/them in these specifications such sections or paragraphs of the AISC Code shall be superseded by the requirements of these Specifications.

1. Paragraph 3.3 shall be superseded by the following: All things that, in the opinion of the Contractor, appear to be deficiencies, omissions, contradictions, or ambiguities in Plans or Specifications shall be brought to attention of Architect and Structural Engineer. Plans and Specifications will be corrected or written interpretation of alleged deficiency, omission, contradiction or ambiguity will be made by Architect and Structural Engineer before effected work proceeds.

2. Paragraph 4.4.1 (b) shall be superseded by the following: Substitute following: Indication of compliance by the Owner of shop drawings prepared by the fabricator indicates that the fabricator has correctly interpreted the contract requirements. Such indication does not relieve the fabricator of the responsibility assigned to him for the design and detailing of connections assigned to him, nor for the accuracy of dimensions on the shop drawings, nor for general fit up of parts to be assembled in field.
3. Paragraphs 7.2 through 7.6 shall be superseded as follows: All references to "owner" shall be superseded as references to "contractor".

E. Qualifications for Welding Work: Contractor shall retain testing laboratory to provide qualification of welding processes and welding operators in accordance with AWS "Standard Qualification Procedure". Provide certification that welders employed in work have as follows:

1. Satisfactorily passed AWS qualification tests based on most current AWS standards and procedures and have been continuously employed by the same Contractor since becoming certified.
2. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous twelve (12) months.
3. Where a partial penetration or complete penetration weld is found defective or, in the opinion of the ITL, requires other than superficial repairs, the welder responsible shall be suspended from such work until recertification for such work and positions is achieved. If after recertification the welder's work is again found other than superficially defective, the welder shall be dismissed from such work for the remainder of the project.
4. Where recertification of welders is required, both cost and retesting will be Contractor's responsibility.

F. Structural Steel Fabricator Qualifications: Structural Steel shall be fabricated by a qualified fabricator who participates in the AISC certification program and is designated as an AISC Certified Plant "STANDARD FOR STEEL BUILDING STRUCTURES (STD)" AND structural steel fabricator must demonstrate a consistent record of at least ten (10) successful projects over the preceding five (5) years each of a magnitude equal or greater than the total structural steel scope of this project. The Contractor shall submit evidence to the Architect within 48 hours of bid opening verifying one of the required qualifications.

G. Structural Steel Erector Qualifications: Structural Steel shall be erected by a qualified installer who participates in the AISC certification program and is designated as an AISC "ADVANCED CERTIFIED STEEL ERECTOR (ACSE)" and has demonstrated a consistent record of at least ten (10) successful projects over the preceding five (5) years each of equal or greater magnitude than the total erection scope of this project. The Contractor shall submit evidence to the Architect within 48 hours of bid opening verifying one of the required qualifications.

Bids From Contractors Including Fabricators Or Erectors Not Meeting
The Above Requirements Will Be Disqualified And Rejected

H. Responsibility For Connection Design: Fabricator shall be responsible for design of connections not designed or shown on contract documents. In fulfillment of this responsibility, Fabricator shall retain a professional engineer (Connection Design Engineer - CDE), registered in the state where the project is located, who shall be in responsible charge of the design, detailing, and proper implementation and coordination of all such connections as part of fabricator's preparation of shop drawings.

All Shop Drawings And Connection Design Calculations Submitted For
Review Containing Connections Designed By Fabricator Shall Be Signed
And Sealed By Fabricator's CDE

1. Fabricator's CDE shall include a statement with his seal indicating that his seal represents only the design, detailing, and proper implementation and coordination of the connections designed by him

and shown on his drawings and that no responsibility nor liability is assumed by him with regard to the capacity or design of any members nor to the integrity or safety of the structure as a whole.

2. Fabricator's CDE shall be responsible only for the connection design work assigned to him. Structural Engineer of Record (SER) retains responsibility for the adequacy of the entire structure. SER'S review of submittals from fabricator will begin ONLY AFTER fabricator's compliance with this requirement.
3. The Contractor shall submit evidence to the Architect within 48 hours of bid opening verifying Fabricator's compliance or ability to comply with above requirements.

Failure To Comply Or Failure Of Ability To Comply Shall Disqualify
Fabricator's Bid And Shall Require Termination Of Fabricator's Contract

I. Responsibility For Errors: The Contractor shall be responsible for all errors of detailing and fabrication, for the correct fitting of structural members, and for correction of work which does not conform to specified requirements including, but not limited to, strength of material, fit up, conformance to tolerance requirements, conformance to welding requirements, conformance to connection requirements, painting, and all other items indicated in the specifications or referenced standards.

1. The Contractor shall correct and/or replace all non-conforming work in manner and with materials approved by the Structural Engineer. If steel is damaged or does not fit, the Contractor shall prepare and submit drawings showing his proposed corrective measures to the Architect. No modifications shall be made to the steel until the Architect and Structural Engineer have approved such drawings. Contractor shall be responsible for cost of such corrective measures including architectural and engineering services.
2. The Contractor shall promptly notify the Architect/Engineer where questions about the intent or clarity of the Contract Documents arise. Where sizes of any elements, dimensions, or assembly are not indicated or are conflicting with other information, the Contractor shall notify the Architect/Engineer in ample time to provide the information or issue a correction without delaying the work. Neither the Contractor nor the Fabricator shall make assumptions regarding the intent of the Contract Documents where such questions arise. No work shall proceed with respect to the affected portions of the structure until such questions are resolved.
3. The Contractor shall make all measurements in the field necessary to verify or supplement dimensions shown on the Contract Drawings and he shall verify that all dimensions shown on shop drawings are coordinated with the dimensions and requirements of the Contract Drawings.

J. Quality Control: Contractor is responsible for quality control and compliance with requirements for materials, workmanship, fabrication, and erection of structural steel including that furnished by subcontractors and suppliers. Contractor shall meet all requirements indicated in the specifications and shown on the drawings.

1. Inspections and tests performed by Owner as part of quality assurance program will not relieve Contractor of his responsibility to provide materials and workmanship in compliance with specified requirements.
2. Materials and fabrication procedures are subject to inspections and tests in mill, shop, and field. Where required such inspections and tests will be performed by an independent testing laboratory (ITL) employed by Owner.

1.4 INSPECTION AND TESTING:

A. Owner will employ, at his expense, a qualified independent testing laboratory (ITL) to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports. Reports shall be furnished directly to the Architect and Structural Engineer with copies forwarded to the Contractor.

1. ITL shall conduct and interpret tests and state in each report whether test specimens comply with requirements and specifically state any deviations therefrom.
2. Contractor(s) shall provide access for ITL to places where structural steel work is being fabricated or produced so required inspection and testing can be accomplished.

3. ITL may inspect structural steel at plant before shipment. However, Architect reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.

B. Contractor/Fabricator shall correct deficiencies in structural steel work that inspections/laboratory test reports have indicated to be not in compliance with requirements. ITL shall perform additional tests to reconfirm any non-compliance of original work as may be necessary to show compliance. Contractor will pay for such tests, including additional architectural/engineering services made necessary by such non-conformance.

C. Structural Steel Testing: Where steel is not or cannot be identified by mill test reports, heat or melt numbers, ITL will secure samples of structural steel in ample quantities to perform structural tests on 5% by weight of all unidentified steel. Perform tensile, bend and elongation test per ASTM A-370.

D. Shop Inspection/Testing: Conduct shop inspections/tests as required during fabrication of structural steel with reports to include shop welder's certifications, type and location of all defects found during inspection, and measures required/performed to correct such defects, statements of final approval of all welding of shop connections and other fabrication data/information pertinent to safe/proper welding of shop connections. ITL shall obtain copies of all welder certifications of welders assigned to job. Inspect and test during fabrication of structural steel assemblies in accordance with AWS D1.1 as well as the following:

1. Perform visual inspections of all welds. Check for size, pinholes, undercut, and overlap. Any visual indication of cracks shall be checked further using magnetic particle testing methods.
2. Perform non-destructive test of welds as follows:

    a. Partial penetration welds - one (1) spot test per weld using magnetic testing techniques.
    b. Full penetration welds - test entire length of all welds; use radiographic or ultrasonic testing techniques.

3. All welds that fail shall be re-welded and re-tested until they pass. When spot testing is designated, each spot shall cover at least 4" of weld length. When spot testing reveals indication of flaws requiring repair, two additional spots in that joint shall be tested. If indications of flaws requiring repair are revealed in either of two spot tests, entire length of weld in that welded joint shall be tested.

E. Field Inspection/Testing: Conduct field inspections/tests as required during erection and installation of structural steel assemblies in accordance with AWS D1.1 for welding and AISC Specification for Structural Joints for high-strength bolted connections and as indicated below. Reports to include bolt, nut, and washer verification, bolt torque verification where slip-critical connections are required, field welder's certifications, type and location of all defects found during inspection, and measures required/performed to correct such defects, statements of final approval of all welding of field connections, stud shear connector welding, metal decking weld attachment, and other erection data/information pertinent to safe/proper bolting and welding of field connections. ITL shall obtain copies of all welder certifications of welders assigned to job.

1. Certify welders and conduct inspection and tests as required. Record types/location of all defects found in work. Record work required and performed to correct deficiencies. Recertify welders where required.
2. Perform visual inspection of all welds. Check for size, pinholes, undercut, and overlap. Any visual indication cracks shall be checked further using magnetic particle testing methods.
3. Perform non-destructive tests of welds as follows:

    a. Fillet welds - one (1) spot per multipass (>5/16”) welds. Magnetic particle testing may be used.
    b. Partial penetration welds - one (1) spot test per weld using magnetic particle testing techniques.
    c. Full penetration welds - Test entire length of all field welds. Use radiographic or ultrasonic testing techniques.

4. Correction for complete weld rejection shall be same as described under shop inspection and testing.
5. Visually inspect all bolts for:

    a. Number, diameter, length, and head mark.
    b. Proper type of washers and nuts.
    c. "Snug tight" condition in ALL JOINTS.
    d. Flat hardened steel washers or common steel plate washers installed over all slotted hole conditions.

6. Test a minimum of ten percent (10%) of the bolts, but at least two bolts, in all "SlipCritical" bolted connections for proper bolt tension and check for proper assembly with hardened washers.
7. Calibrate impact wrenches during erection operations using three (3) bolts of each type, size, and thread of bolt that will require testing. Measure bolt tension to the proof load required for ASTM A325 or A490 bolts as required. For each day of inspection, repeat calibration before beginning work and at the mid-point of the day's operations.
8. All bolted connections that fail shall be corrected and all bolts in that connection shall be re-tested. Cost of tests on connections that fail shall be borne by the Contractor.
9. Bolts in bearing connections SHALL NOT be tensioned without the approval of the Structural Engineer. Bolts in bearing connections tensioned without approval may require removal and replacement at Contractor's expense.
10. Stud shear connector welding inspection/testing procedures shall comply with requirements of section 7.7 of AWS D1.1-90.
11. Check number, spacing, and length of studs. Evaluate weld quality by visual inspection of welds for full 360-degree flash and by striking each stud with six (6) pound hammer.
12. For a minimum of two studs per beam and for all studs where welds do not exhibit full 360 degree weld flash around stud:

    a. Bend studs to approximately 15 degrees from vertical, opposite from the direction of the missing flash, by hammering, without fracturing welds. Threaded studs shall be torque tested not bend tested.
    b. If failure occurs in either of the welds tested, then another two (2) studs shall likewise be tested, if failure occurs in either of the second pair then all studs on the beam shall be tested.
    c. Studs passing test need not be hammered back to vertical.
    d. Studs failing test shall be replaced and re-tested. If the base metal is damaged or pulled out during stud removal, repairs shall be made in accordance with AWS D1.1 and subject to approval by the ITL.

13. At the start of each stud welding production period:

    a. Examine first two (2) studs for full 360-degree weld flash.
    b. Test first two (2) studs by bending to approximately 30 degrees from vertical, toward nearest end of beam, by hammering, without fracturing welds.
    c. If either or both of the studs do not exhibit full 360 degree weld flash or if on testing failure occurs in the welds, then the welding procedure shall be corrected and another two (2) test studs shall be welded and likewise tested prior to beginning production. This operation shall be repeated until proper welding and successful testing is achieved.
    d. None of these test studs are to be considered as part of the required shear connectors.

1.5 SUBMITTALS:

A. General: Contractor shall establish and provide a mutually agreed upon "Submittal Schedule" prior to beginning transmission of submittals for review. There is no requirement for the Architect or Structural Engineer to process or review any submittals prior to this Schedule being established and distributed to all relevant parties involved in Submittal preparation, processing, and review.

1. Schedule shall identify and indicate individual packages, submittal dates, and required return dates. Dates shall be the date that the submittal is scheduled to arrive in the Structural Engineer's office for

review to begin and the date that the returned submittal is required to arrive in the Contractor's office for distribution to his sub-contractors and fabricators.

2. Scheduled review and return of submittals/shop drawings shall be based on a MINIMUM of FIFTEEN (15) WORKING DAYS in the Structural Engineer's office from receipt of submission to return to the next party for their action.
3. Shop drawings should be submitted incrementally as appropriate packages are prepared to equalize the workload for review of the drawings and expedite the return schedule. Submission of a large volume of shop drawings at one time may result in review times that will be required to exceed those noted above. Definition of a "large volume" of shop drawings is subject to mutual interpretation.
4. Contractor shall provide in his Schedule for the above noted time and for appropriate additional time for delivery (shipping) of drawings. No claims may be made on the part of the Contractor for delay of the project due to shop drawing reviews that occur within the above stated time limits or for reviews that take greater time than noted above due to submission of a large volume of shop drawings at one time.

B. Manufacturer's Data: Submit two (2) copies of producer/manufacturer's specifications and installation instructions for the following products. Include laboratory test reports/other data required to show compliance with test specifications. Indicate by transmittal form that a copy of each applicable instruction has been distributed to fabricators, installers and erectors:

1. Structural steel (each type) including certified copies of mill reports covering chemical/physical properties.
2. High strength bolts (each type) including nuts and washers.
3. Direct Tension Indicators, if used.
4. Unfinished bolts and nuts.
5. Structural steel primer paint, if required.
6. Shrinkage-resistant grout.
7. Headed shear connectors

C. Structural Fasteners: Submit complete manufacturer's specifications and test reports certifying that all structural fasteners (bolts) comply with requirements for ASTM A325 or A490 and for DOMESTIC FASTENERS ONLY. American or Canadian fasteners are permitted provided:

1. The steel used in the fastener was produced in either the United States or Canada.

2. The fastener was produced/manufactured completely in either the United States or Canada.

D. Calculations: Submit complete calculations for each connection designed by Fabricator's CDE. Calculations shall show details of the assembled joint with all bolts and welds indicated. All design calculations shall be sealed by the Fabricator's CDE.

Shop Drawings Submitted Without Complete Design Calculations Will Not Be Reviewed.

1. Calculations need not be performed for pre-designed connections taken from tables in AISC manuals and publications provided job conditions precisely match conditions presumed in the tables. Calculations shall be provided for all variations from conditions presumed in the tables. All information used from such tables shall be clearly identified with the table number and all such connections shall be indicated in the calculations submitted.

E. Shop Drawings: Submit drawings including complete details/schedules for fabrication, shop assembly, and field erection of members, including details, schedules, procedures, and diagrams showing sequence of erection. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols and show size/length/type each weld. Provide setting drawings, templates, and other directions for installation of anchor bolts and other anchorages to be installed by others. Fabricator's erection drawings/shop details shall clearly show capacity of connections designed by

fabricator. Fabricator's/Erector's shop drawings shall contain information and details developed in sufficient detail for field erection and assembly without the use of the Construction Documents.

1. Submit full scale electronic PDF files of each shop drawing for review via email or FTP download. PDF files shall be generated from original CAD drawing files with multiple drawings contained in a single PDF file.
2. Reproducible copies of contract documents shall not be used as shop drawings without prior written indemnification with respect to items for which the Contractor alone is responsible.
3. Contractor shall employ technically competent staff to thoroughly review the shop drawings prior to submission. Shop drawings not demonstrating competent preparation or understanding of the Contract Documents both drawings and specifications (i.e. containing numerous errors and/or omissions) shall not be forwarded to the Architect/Structural Engineer but shall be returned to the source for correction following the Contractor's review.
4. Drawings shall bear Contractor's approval stamp accepting responsibility for coordination of dimensions shown in the contract documents, quantities and coordination with other trades. Drawings not bearing Contractor's stamp or not showing evidence of being reviewed by a technically competent representative (due to the magnitude of submitted errors) may be rejected at the discretion of the Architect or Structural Engineer.
5. Shop drawings rejected due to non-compliance with the structural documents shall be resubmitted with the same time requirements for review as a new submittal as noted above. No claims may be made on the part of the Contractor for delay of the project due to shop drawings rejected due to non-compliance with the structural documents. Such delays, if they occur, shall be attributable entirely to the Contractor's Fabricator.
6. Shop drawings submitted for more than two reviews due to fabricator's non-compliance shall result in time for additional engineering services being charged to the Contractor.

F. Changes and Deviations: After submittal review, neither products nor construction requirements indicated on the shop drawings may be changed or deviated from. Changes following shop drawing review may be requested by the Contractor in writing, separate from shop drawings and shall clearly delineate requested change. Contractor shall not proceed with any requested changes until notified by Architect/Structural Engineer, in writing, of acceptability.

G. Engineer's Review: Structural Engineer's review of shop drawings will be for general considerations involving compliance with design requirements of project and does not constitute Owner's acceptance of responsibility for connections designed by fabricator's Engineer as part of his preparation of shop drawings. Structural Engineer's review of the drawings shall include following checks:

1. Check shapes, sizes, steel grades, and locations
2. Detailed check of all design calculations
3. Spot check typical shear connections
4. Detailed check of moment connections
5. Detailed check of truss connections
6. Detailed check of built-up sections
7. Detailed check of special connections
8. Check anchor bolt layouts, sizes, and lengths
9. Check column base plate elevations
10. Spot check various dimensions

H. Structural Drawings: All details shown are typical. Similar details apply to similar conditions unless otherwise indicated. Verify dimensions at site where possible without causing delay in work. Promptly notify Structural Engineer when design of members for any portion of structure is not clearly indicated. Contractor shall consider all dimensions and elevations of, or relating to, existing construction as approximate. Such dimensions and/or elevations shall be field checked by Contractor if they affect Contractor's work.

I. Surveys: General Contractor shall employ a registered Land Surveyor or Professional Engineer to evaluate accuracy of erection of structural steel. The following surveys shall be conducted and submitted for Architect's and Structural Engineer's review:

1. Pre-Erection Survey: Check elevations of concrete, masonry, or steel bearing surfaces and check anchor bolt locations prior to erection of any structural steel. Submit notification of discrepancies to the Structural Engineer prior to erection of any structural steel. Corrections and/or adjustments to bearing surfaces or structural steel shall be made and approved prior to the start of any structural steel erection.
2. Post-Erection Survey: Following completion of structural steel erection and prior to the start of work by other trades which may be supported/attached/applied to the steel frame, a final survey shall be made which shall indicate the elevations/alignments/plumbness of the steel frame. Submit a final report to the Structural Engineer certifying compliance with the required tolerances indicated in the specifications or on the drawings.

1.6 MATERIALS FURNISHED BY CONTRACTOR AND INSTALLED BY OTHERS:

A. Anchor bolts and other anchorage devices embedded in cast-in-place concrete or masonry construction shall be delivered at project site in time to be installed before start of cast-in-place concrete operations or masonry work.

B. Structural steel erection contractor is responsible for checking "as-built" position of anchor bolts and other items cast into concrete or embedded in masonry. Erection contractor shall notify General Contractor of all items not positioned within acceptable tolerances.

C. General Contractor will be responsible for corrective work required by misplacement of such items. Such work is subject to approval of Architect.

1.7 DELIVERY, STORAGE AND HANDLING:

A. Deliver material to site at such intervals to insure uninterrupted progress of work. Deliver anchor bolts/anchorage devices to be embedded in cast-in-place concrete or masonry, in ample time so as to not delay work.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

C. Do not store materials on structure in manner that might cause distortion or damage to members or supporting structures. Repair/replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Metal Surfaces: For fabrication of work exposed to view, use only materials smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names, and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and application of surface finishes.

B. Rolled Wide Flange Steel Shapes: Wide Flange steel shapes as shown on structural drawings shall be ASTM A992, (Fy =50 ksi) unless otherwise noted on the drawings. Other steel is permitted only where specifically shown or indicated on the drawings.

C. Rolled Steel Plates, Angles, Channels, Tees, Rods and Bars: Steel shapes (other than Wide Flange shapes indicated above) as shown on structural drawings shall be ASTM A36 (Fy = 36 ksi) unless otherwise noted

on the drawings. ASTM A992 or ASTM A572 (Fy =50 ksi or other strength) is required only where specifically shown or indicated on the drawings.

1. Plates greater than 2" in thickness used in built-up sections when spliced with full penetration welds shall be supplied with Charpy V-notch testing (CVN) in accordance with ASTM A6, Supplementary Requirement S5. The impact test shall meet a minimum average value of 20 ft-lbs absorbed energy at +70 degrees F and shall be conducted in accordance with ASTM A673 with the following exceptions:

    a. The center longitudinal axis of the specimens shall be located as near as practical to midway between the inner flange surface and center of the flange thickness at the intersection with the web mid-thickness.
    b. Tests shall be conducted by the producer on material selected from a location representing the top of each ingot or part of an ingot used to produce the product represented by these tests.

2. The CVN test also applies to plates with thickness exceeding two inches when complete penetration welded joints through the thickness of the material are used in moment connections or tension splices.

D. Hollow Structural Sections (HSS - Rectangular and Square): ASTM A500, Grade B, Fy 46 ksi.

E. Hollow Structural Section (HSS – Round): ASTM A500, Grade B, Fy=42 ksi.

F. Steel Castings: ASTM A27, Grade 65-35, medium-strength carbon steel.

G. Anchor Rods: ASTM F1554 Grade 36, U.N.O. on the drawings, with weldability supplement S1 threaded round stock. Galvanized anchor bolts and nuts shall be used in all conditions where galvanized base plates are required. Provide anchor bolt washers complying with AISC Table 14-2 "Recommended Sizes for Washers and Anchor Rod Holes in Base Plates"

H. Structural Pins: ASTM A36 and ASTM A108

I. High Strength Threaded Fasteners: All fasteners shall be high strength threaded fasteners complying with the AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts" in accordance with the following:

1. Heavy Hex Structural Bolts: Heavy hex structural bolts complying with ASTM A325 or A490 Type 2. Where threads are permitted in the shear plane, bolts complying with ASTM A325T supplement are permitted. Bolt geometry shall conform to ANSI Standard B18.2.1, unless approved otherwise by the Structural Engineer. Length of bolts shall be such that the end of the bolt will be flush with or outside the face of the nut when properly installed. ASTM A490 bolts SHALL NOT be galvanized. Minimum bolt diameter shall be ¾", unless indicated otherwise on the drawings.
2. Heavy Hex Nuts: Heavy hex nuts complying with ASTM A194 Grade 2H or A563 Grade DH, except that galvanized nuts for use with galvanized bolts shall be ASTM A563 DH. Nut geometry shall conform to ANSI Standard B18.2.2, unless approved otherwise by the Structural Engineer.
3. Hardened Steel Washers: Circular, flat, and smooth hardened steel washers conforming to ASTM F436 shall be used with all fasteners. Washer geometry shall conform to ANSI Standard B23.1 Type A unless otherwise noted. Washers for American Standard Beams and Channels shall be beveled square or rectangular washers with an average thickness of 5/16" and shall taper in thickness with a slope of 16 2/3%. Where the outer face of a bolted element has a surface sloping greater than 1:20 with respect to the axis of the bolt, a beveled washer shall be used.
4. Galvanized Bolts: Where steel is noted on the drawings or in the specifications to be hot dip galvanized, provide hot dip galvanized bolts, nuts, and washers in accordance with ASTM A153 Class C for all bolted connection between such materials or between such materials and other non-galvanized materials.

5. Load Indicating Devices: Load indicating devices may be used in conjunction with specified bolts, nuts, and washers. Such devices shall conform to the requirements of ASTM F959, "Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners".
6. Origin: Domestic Fasteners Are Required (American Or Canadian) - no imported fasteners are permissible for any use in structural steel work on this project.

J. Headed Stud-Type Shear Connectors (Studs): Shear Connectors shall meet all requirements of Section 7 of AWS D1.1 and shall conform to ASTM A108, Grade 1015 or 1020 cold finish carbon steel; with dimensions complying with AISC Specifications. Provide arc shields (ceramic ferrules) for welding of each stud. After welding ferrules shall be removed form each stud. Sizes of studs shall be as indicated on the drawings.

K. Electrodes for Welding: Comply with table 4.1.1 of AWS D1.1-90. Minimum electrodes shall be E70XX.

L. Structural Steel Primer Paint: Subject to compliance, provide primer paint of one of the following types with surface preparation in accordance with manufacturer's recommendations and instructions:

1. Porterprime 2.8 Low VOC Universal Primer 288 by Porter Paints.
2. Modified Alkyd Series 10 Primer by Tnemec Company.

M. Refer to Architect's drawings and specifications for final paint color and for finish requirements of structural steel. Primer paints shall be compatible with final paint formulation and requirements.

N. Hot Dip Galvanizing: After fabrication, hot dip galvanize all structural steel elements and connections which shall be permanently exposed to exterior conditions - whether specified on the drawings or not.

1. Refer to the architectural and structural drawings for other items required to be hot dipped galvanized.

   Items shall include but are not limited to: a. Shelf angles or plates and lintel angles or plates.

   b. All plates embedded in concrete.
   c. All cladding (building skin) support steel extending beyond the waterproofing envelope.
   d. All parapet wall supporting members.
   e. All cooling tower supporting members.
   f. All window washing equipment support members or connections.

2. Galvanize all nuts, bolts, and washers used in connections of galvanized materials. Treat all field welds with "GALVILITE" manufactured by ZRC Worldwide., or approved equal.
3. Surface preparation for all hot dipped galvanized steel shall be in accordance with SSPC Volume 2.

   a. Remove grease, oil, grime, and all other contaminants by thorough cleaning with alkaline or organic solvent and rinse thoroughly with cold water.
   b. Remove scale by pickling in diluted sulfuric or hydrochloric acid. Pickling shall be followed with a warm water rinse then a second cold water rinse. Alternately, steel may be cleaned per SSPC-SP-5 (White Metal Blast Cleaning).
   c. After all cleaning, dip steel in a flux solution of zinc ammonia chloride and air dry at room temperature.

4. Zinc coating for steel shapes and plates shall conform to ASTM A123 "Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products". Weight of zinc per square foot of surface shall be as follows:

   a. 1/8" and 3/16" thick materials 2.0 oz. avg. 1.8 oz. min.
   b. 1/4" and thicker materials 2.3 oz. avg. 2.0 oz. min.

O. Cold Galvanizing: "GALVILITE" manufactured by ZRC Worldwide, or approved equal, applied in accordance with manufacturer's instructions.

P. Slide Bearing Assemblies: Frictionless bearing pads (slide bearings) shall be a nominal 3/32" thick glass filled virgin Tetrafluoroethylene (TFE) conforming to ASTM D1457 bonded to a minimum 10 gauge A36 steel backing plate. Bearing pad size and design shall conform to manufacturer's requirements. Design bearing pressure shall not exceed 2000 psi under full service load conditions. The manufacturer shall certify bearing pads for use in conditions exposed to weather and ultraviolet radiation for such use. Where used in conditions exposed to the weather, steel backing plates shall be shop painted with a zinc rich paint or field painted with "GALVILITE" manufactured by ZRC Worldwide, or approved equal.

1. Subject to compliance, one of the following manufacturers:

    a. The Fluorocarbon Company
    b. Con-Serv Inc.
    c. EGC Corporation.

2. Provide one sliding pad each, tack welded to the upper and lower steel support surfaces. Unless detailed otherwise on the drawings, the upper pad shall be larger than the lower pad on all sides by the amount of the expansion joint width indicated on the drawings.
3. Provide slide bearing assemblies at all beam and slab elements where only a single support is indicated at expansion joints shown on the drawings.

Q. Elastomeric Bearing Assemblies: Elastomeric bearing pads (neoprene bearings) shall 100% chloroprene (neoprene) as the only elastomer. Pads shall conform to the requirements of the AASHTO Standard Specification for Highway Bridges Section 25 Division 2. Provide pads with a durometer Shore A hardness of sixty plus or minus five. Bearing pad design shall conform to the PCI Design Handbook, 3rd edition, Section 6.5.8. Design bearing pressure shall not exceed 800 psi under full service load conditions nor 500 psi under full dead load conditions.

1. Provide beveled bearing pads assemblies between non-parallel surfaces. Subject to compliance, one of the following manufacturers: a. Con-Serv Inc.
    b. Tulsa Rubber Company
    c. Old North Mfg. Inc.
    d. JVI Inc.
    e. Oil States Industries.

R. Wedge Anchors: All expansion bolts used in concrete shall be wedge type expansion bolts only. Diameter and minimum capacity shown on drawings; minimum safety factor of 4. Only expansion bolts with a published research report approved the International Conference of Building Officials (ICBO) shall be permitted for use in work on this project. Install into concrete or solid grouted concrete masonry with minimum embedments according to manufacturer's recommendations. Expansion bolts shall be furnished as a single complete assembly from one manufacturer including bolt, nut, and washer.

1. Interior Use: Expansion bolts, nuts, and washers used in controlled interior conditions free from moisture shall be zinc-plated carbon steel in accordance with Federal Specification QQ-Z-325C, Type II, Class 3.
2. Exterior or Exposed Use: Expansion bolts, nuts, and washers used in exposed or in conditions with potentially high moisture or for exterior cladding material attachment shall be stainless steel. Bolts shall be 300 series stainless steel and nuts and washers shall be 300 series or Type 18-8 stainless steel.
3. Subject to compliance, one of the following or approved equal:

    a. "Strong Bolt 2” by Simpson Strong Tie Co. Inc.
    b. "Kwik-Bolt III" by Hilti Fastening Systems

S. Adhesive Bolts: Adhesive bolts for use in concrete shall consist of a threaded steel rod as indicated below and a two epoxy adhesive. The adhesive shall be furnished in side-by-side refill packs which keep

component A and component B separate. The mixture shall be dispensed through a static-mixing nozzle supplied by the manufacturer. The adhesive anchor shall have been tested and qualified for performance in cracked and uncracked concrete per ICC-ES AC308. Only adhesive bolts with a published research report approved by the International Conference of Building Officials (ICBO) shall be permitted for use in work on this project. Install into concrete or solid grouted concrete masonry with minimum embedments according to manufacturer's recommendations. Adhesive bolts shall be furnished as a single complete assembly from one manufacturer including bolt, nut, washer, and epoxy adhesive system.

1. Interior Use: Adhesive bolts used in controlled interior conditions free from moisture shall be ASTM A-307 threaded steel rods.
2. Exterior or Exposed Use: Adhesive bolts used in exposed or in conditions with potentially high moisture or for exterior cladding material attachment shall be 300 series threaded stainless steel rods. Nuts and washers shall be 300 series or Type 18-8 stainless steel.
3. Subject to compliance, the following or approved equal:

    a. “SET-XP” by Simpson Strong-Tie.
    b. "HIT-RE 500 Epoxy Adhesive Anchoring System" by Hilti Fastening Systems

T. Sleeve Anchors: Diameter and minimum capacity shown on drawings; minimum safety factor of 4. Install into brick or hollow concrete masonry with minimum embedments according to manufacturer's recommendations. Subject to compliance, one of the following manufacturers:

1. Hilti
2. Simpson Strong Tie Co. Inc.

PART 3 - EXECUTION

3.1 FABRICATION:

A. Shop Fabrication and Assembly: Fabricate/assemble structural assemblies in shop to greatest extend possible. Fabricate items of structural steel in accordance with the AISC Specifications, the AISC Code of Standard Practice, and as indicated on final shop drawings.

1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials. Fabricator shall coordinate fit-up procedures with erector.
2. Clearly mark grade of steel on each piece such it will be identifiable in the field from the viewpoint of the floor below or ground below for the purpose of field inspection and confirmation of steel grade.
3. All corners, copes, or other re-entrant cuts shall be smooth and rounded to a minimum 1/2" radius. No notches or overcuts are permitted - such members may be rejected at the discretion of the Structural Engineer.
4. Fitted stiffeners shall be fabricated to fit snugly between flanges. Ends of stiffeners shall be milled or ground to establish full bearing against abutting surfaces over their entire bearing length.
5. Ends of columns and truss members at splices and at other bearing connections shall be finished to establish full bearing against abutting surfaces over their entire bearing length. Filler plates used at finished surfaces shall be finished together with the member.
6. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
7. Dimensional tolerances shall conform to those specified in the referenced AISC standards or as indicated in the specifications or on the drawings.
8. Provide camber in structural members where indicated on the drawings in accordance with following:

    a. Fabricate all beams, girders, and truss members with any natural or mill cambers upward irrespective of whether or not camber is indicated on the drawings.
    b. Camber members by cold bending processes wherever possible.

c. Local application of heat to introduce or correct camber, curvature, or straightness is permissible where measured temperature of heated area does not exceed 1200 deg. F.
d. Where indicated in cambering details on the drawings, the main span and cantilever end(s) of cantilever or double cantilever members shall be cambered separately by either a staged cold bending process or by application of heat.
e. Specified camber, in place, shall be within minus zero to plus 1/16" for each ten feet of member length. Specified camber for trusses or plate girders shall be fabricated into the member within minus zero to plus 10% of the specified camber.
f. Cambers indicated on the drawings are final in place cambers following erection. Fabricator shall account for camber loss during and subsequent to cambering operations.

9. Manual cutting shall only be done with a mechanically guided torch. An unguided torch may only be used where the cut is not within 1/8" of the finished edge and final finishing is done by chipping or grinding to produce a smooth surface free of notches or jagged edges.
10. Milled surfaces of built-up elements shall be completely assembled or welded prior to milling.

B. Lifting and Erection Devices: Fabricator shall be responsible for designing, detailing, and furnishing all lifting and erection devices as required. All such devices shall be removed after erection where interference with other finishes or trades occurs.

C. Connections: Connections shall be designed to accommodate the following requirements, unless indicated otherwise on the drawings:

1. Shear connections, unless noted otherwise, shall be designed to support half the allowable load on beam, defined in the AISC Table 3-6 "Maximum Total Uniform Loads" or reaction shown on drawings, or minimum 10 kips, whichever is greater. Reactions for composite members are shown on the drawings and connections for such members shall be designed for those reactions.

   a. Where connections are designed for loads taken from the AISC Table 3-6 "Maximum Total Uniform Loads"", any loads or beam reactions located within ten (10) percent of a member's length from a support connection and any vertical force components of bracing members occurring at a connection shall be added to the reaction for that connection.

2. Moment resisting connections not indicated and/or detailed on the drawings shall be designed for the moment capacity of the member based on the unbraced compression flange length of the member, unless design values for shear and moment have been indicated on plan.
3. Connections not indicated, shown or detailed otherwise on the drawings shall be designed as simple shear connections. All typical beam simple shear connections shall be standard double angle or single angle framed beam connections using either bolts or welds for the shop connection and bolts for the field connection.

   a. Single plate "shear tab" connections may be used provided there is no axial force in the member. Such connections shall be designed in strict accordance with the AISC requirements for the grade of steel used. Short slotted holes shall be used in either the web of the beam or in the tab plate, not both, to accommodate beam end rotation. Bolts shall be snug-tight. Bolts shall be bearing type only. Slip-critical connections are not permitted in single plate "shear tab" connections. DO NOT tension bolts in shear tab connections.

4. Where building has been classified as a "High-Rise" and is assigned either Risk Category III or IV beam connections are to be designed for the factored vertical reactions shown on plan as well as a tension load equal to 1/3 of the vertical load if a composite beam and 2/3 of the vertical load if a non-composite beam, but not less than 10 kips of tension load.

5. Seated beam or stiffened seated beam connections shall not be used unless indicated on the drawings or unless Structural Engineer approves capacity of supporting member to resist the

eccentric loads applied by such connections. Fabricator is responsible for verifying that such connections will not interfere with architectural or mechanical requirements.

6. Capacity of members affected by copes, blocks, holes or other reductions in the member section necessitated by details of connection shall be checked by the CDE. Where required, member capacity shall be restored or reinforced to accommodate required loads. Details required to restore or reinforce members shall be designed by the CDE.
7. Weld or bolt shop connections, as indicated. Bolt field connections, except where welded connections or other connections are indicated. Provide a minimum of two high-strength threaded fasteners for all bolted connections.
8. All groove butt welds are full penetration unless noted or detailed otherwise on the drawings. Provide necessary back-up, extension, or over-run bars or plates as required.
9. High strength bolts used in bearing type connections shall not be used in combination with welds for load transmission across the same faying surface in any connection. .

D. High-Strength Bolted Construction: Install and test high-strength threaded fasteners in accordance with these specifications and AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" (RCRBSJ). All bolts shall be new and shall not be re-used.

1. All bolted construction shall be AISC bearing type connections, except as below or unless indicated otherwise on the drawings. Connections shall use standard hole sizes for the bolt diameter employed and threads shall be assumed included in the shear planes.
2. Shear connections at simple span members shall accommodate unrestrained beam end rotations as indicated in the AISC Specification.
3. Shear connections for welded moment connected elements and for all brace elements shall be AISC slip-critical connections.
4. Dimensions and washer requirements for oversize, short slotted, and long slotted holes shall be in accordance with the AISC Specification requirements.
5. Tightening of bolts shall be in accordance with the following requirements and procedures:

    a. Tighten high strength bolts in bearing connections to a snug tight condition. Snug tight condition is defined as that attained with an impact wrench providing 200 footpounds (± 20 ft-lbs) of torque for each bolt. Do not over-torque bearing bolts in snug tight connections or removal of bolts may be required.
    b. Tighten high strength bolts in slip-critical connections to required bolt tension in accordance with AISC Specifications.
    c. Washers shall be used with all bolted connections in accordance with the AISC Specification.
    d. All field tightening of high strength slip-critical bolts shall utilize load indicating washers or bolts in accordance with the manufacturer's requirements.
    e. Shop tightening of high strength slip-critical bolts shall utilize either load indicator washers or load indicator bolts.

6. All bolts shall be well lubricated at the time of installation. Dry and/or rusty bolts are not permitted and shall be removed and replaced if used..
7. Where bolted connections are transferring axial forces, the connections shall develop the full tensile or compressive strength of the member, unless indicated otherwise on the drawings. Where bolted connections are transferring flexural forces (moment connections), the bolted connections shall develop the full flexural capacity of the member, unless indicated otherwise on the drawings.

E. Welded Construction: All shop and field welding shall comply with AWS Code D1.1 for procedures, appearance, and quality of welds, and methods used in correcting welding work. For high-strength low-alloy steels, follow welding procedures recommended by steel producer for exposed/concealed connections.

1. Shop and field welders shall be certified according to AWS procedures for the welding process and position to be used.
2. Welding shall be done in strict accordance with the methods and procedures specified in the AWS code, the approved shop drawings, and the structural drawings. Before any welding is performed,

attention shall be paid to surface preparation, fit-up, cleanliness of materials, and back-up materials or welds.

3. Minimum sizes and materials for welds shall be in accordance with AISC Specification Tables as noted below:

    a. Fillet welds per Table J2.4.
    b. Minimum effective throat thickness of partial-penetration and flare groove welds per Tables J2.1, J2.2, and J2.3.
    c. Filler weld metal shall be as specified in AISC Specification Table J2.5.

4. Welds not specified shall be continuous fillet welds, wherever possible. All welds shall be sound throughout. Welds shall exhibit no crack in any pass and shall be free from overlap. Craters shall be filled to the full cross section of the weld. Welds conforming to AWS requirements, as inspected by non-destructive testing, shall be considered sound.

5. Follow welding procedures recommended by steel producer for high-strength low-alloy steels.
6. Fabricator shall coordinate with erector the welding responsibilities at all field welded joints.
7. Built-up sections assembled by welding and other weldments shall be assembled in accordance with the following:

    a. Elements assembled by welding shall be free of warpage and all axes shall be in straight and true alignment. Assemble and weld built-up sections by methods that will produce required alignments without inducing warping.
    b. Welding procedures shall be developed considering steel toughness and notch sensitivity in order to prevent premature or brittle fracture during fabrication and erection. Minimum preheat and interpass temperatures shall be in accordance with AWS requirements, except that no welding shall be performed when ambient temperatures are below 0 deg. F. Temperature shall be measured opposite from the face on which preheating is performed.
    c. Heat, input, length of weld, and sequence of welding shall be controlled to prevent distortions. Surfaces to be welded and filler metals shall be subject to inspection prior to beginning welding.
    d. Field moment connections where beams are groove welded directly to columns or girders shall not be welded until after all erection bolts are installed and the members are drawn together. However, all welds shall be made before any shear connection bolts are tightened.
    e. All elements of weldments shall be welded together to develop the full strength of the elements using "V" or "J" groove welding, except where otherwise indicated on the structural drawings. Welds shall be continuous complete penetration, except where fillet welds can develop the full strength of the elements. Welds made without back-up bars shall have their roots chipped, ground, or gouged out to sound metal on the second face before welding is begun on that face.

F. Preparation and Welding of ASTM A6 Group 4 and 5 Shapes and Plates Greater Than 2” in Thickness:

1. Prior to thermal cutting beam copes, bevels and weld accesses, preheat to a minimum of 150 degrees F.
2. Thermal cut surfaces of beam copes, bevels and weld accesses shall be ground to bright metal and inspected by either magnetic particle or dye penetrant method prior to deposition of welds.
3. Weld metal for complete penetration groove welds shall comply with Charpy V-notch toughness of 20 ft-lbs at 40 degrees F.
4. Preheat to minimum 350 degrees F for all groove welds.
5. At groove welds remove weld tabs, remove backer bars, and grind smooth.

G. Columns and Base Plates: Columns transferring compression forces at bases and at splices dependent on full contact bearing as part of the splice capacity shall have the bearing surfaces of the individual members finished by milling, sawing, or other suitable means. Base plates 2 inches or less in thickness are permitted

without finishing, others shall be finished in accordance with AISC Specification M2.8. Base plates shall be welded all around to columns in accordance with AISC Table J2.4, but in no case with less weld than required to transfer any tension, shear or flexural forces indicated on the drawings. Leveling plates shall be used where indicated on the drawings and shall be detailed and set as indicated on the drawings.

1. Leveling plates shall be set to the required bottom of base plate elevation and properly leveled with anchor bolt nuts placed above and below the leveling plate to hold the plate in the proper location for grouting. Leveling plates shall be set and grouted a minimum of 24 hours prior to erection of columns on them.

2. Where leveling plates are not indicated on the drawings, base plates shall be set to proper elevation and leveled with steel shims or with leveling screws welded in a three screw pattern at the perimeter of the base plate. Plastic, wooden, or masonry shims are not permitted.
3. Anchor bolt holes in leveling plates shall be standard size bolt holes (bolt diameter + 1/16") and shall not be oversized. Anchor bolt holes in base plates shall comply with AISC Table 14-2 “Recommended Sizes for Washers and Anchor Rod Holes in Base Plates.”
4. Plates shall be grouted using specified high strength non-shrink non-metallic grout. Anchor bolts shall not be tightened until framing members have been erected and plumbed.
5. Column splices shall occur at 4’-0” above the top of beam or the depth of the column above the beam and be welded with complete joint penetration groove welds at flanges and web.
6. Column splices shall occur at 4’-0” above the top of beam (UNO) and be welded with complete joint penetration groove welds at flanges and web.

H. Fabricated Trusses: Truss chord and web member centerlines and workpoints are indicated on the truss elevations on the drawings. Fit-up of trusses shall be verified by pre-assembly of the truss in the shop. Truss joint connections are detailed on the drawings or are shown as a schematic representation of the joint condition for the fabricator's CDE. Truss connections shall be detailed and assembled in accordance with the following:

1. Joint connections shall be designed for the member forces indicated on the drawings or, where no forces are indicated, the capacity of the member based on the stress condition indicated. However, all connections shall be capable of transferring a minimum of 50% of the axial capacity of the member based on stress condition indicated on the drawings.
2. Truss joints shall typically be welded. Where bolted joints are used, all bolts shall be highstrength slip-critical bolts and shall be of one size for the entire truss.
3. Tension and compression chord splices shall be made only where indicated on the drawings, except where indicated otherwise on approved shop drawings, and shall use field bolted high-strength slip-critical bolts. Splices shall be capable of transferring a minimum of 50% of the axial capacity of the member based on stress condition indicated on the drawings. End bearing compression chord splices shall be spliced to transfer a minimum of 50% of the required axial force through the splice.
4. Structural tee chords and double angle webs shall utilize welded joint connections. Butt weld gusset plates to chord members where additional connection weld length is required. Gusset plate thickness shall match chord member stem thickness.
5. Where the effective cross section of truss tension members indicated on the drawings is reduced by bolt holes, copes, blocks, etc. the fabricator shall design and provide additional steel reinforcing plates to restore the original capacity of the indicated member.

I. Stiffeners and Web Doublers: Provide fitted bearing stiffeners and/or web doubler plates under all concentrated bearing loads, in all members framing over columns, at all moment transferring beam/column joints (as required per AISC Specifications), and at all locations indicated on the drawings.

J. Hanger and Kickers: Connections for all hangers and kickers not detailed on the drawings shall be designed for the full allowable tensile capacity of the member. Provide welded or bolted connections in accordance with the drawings where so indicated. Provide slotted holes in bolted components where necessary to accommodate field fit-up and erection tolerances. Where slotted holes are used, provide field welding after erection to prevent slip of components under supported loads.

K. Steel Shelf Angles: Steel angles indicated on the drawings supporting masonry veneer shall be detailed in lengths not exceeding thirty feet, but in no case in lengths less than the maximum shelf angle support spacing indicated on the drawings. Angles shall have a minimum of two supports and shall have joints located at the mid-point between supports. Shelf angles shall be complete penetration welded to be continuous around corners and at other joints.

L. Embedded Plates: Plates shall be free of heavy rust, mill scale, dirt, grease, grime, and other foreign material that will interfere with welding of headed studs. Weld studs to plates using automatically timed stud welding equipment. Hot-dip galvanize plates and studs where exposed to exterior weather conditions.

M. Steel Wall Framing: Select members that are true and straight for fabrication of steel wall framing. Straighten as required to provide uniform, square, and true members in completed wall framing.

1. Build up welded doorframes attached to structural steel framing. Weld exposed joints continuously and grind smooth. Plug-weld steel bar stops to frames, except where shown removable. Secure removable stops to frames with countersunk, cross-recessed head machine screws uniformly spaced not more than 10 inches o.c., unless indicated otherwise.

N. Holes for Other Work: Provide holes securing other work to structural steel framing, and passage of other work through steel framing members, as shown on final shop drawings; provide threaded nuts welded to framing, and other specialty items as indicated to receive other work. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

3.2 SHOP PAINTING:

A. General: Surface preparation, paint, and painting procedures shall conform to the "Steel Structure Painting Manual", volumes 1 and 2, by the Steel Structures Painting Council (SSPC). Comply with SSPC-PA1 “Shop, Field, and Maintenance Painting of Steel.

1. After fabrication shop-paint all structural steel except as noted on the drawings or in the specifications.
2. Do not paint surfaces to be fireproofed with spray-on materials or embedded in concrete, mortar, or grout (paint initial 2" of embedment). Do not paint top flanges of composite beams, nor other surfaces to receive welded studs, nor within 2" of surfaces that will be welded, nor surfaces where bolting with slip-critical bolts, or where otherwise noted on the drawings.
3. Coordinate all shop painting of structural steel with Architect's painting requirements as indicated on the architectural drawings and in the specifications.

B. Surface preparation: After fabrication and inspection, clean steelwork to be painted. Remove loose rust, mill scale and spatter, and slag or flux deposits. Clean steel in accordance with paint manufacturer's instructions using prescribed surface preparation and in accordance with Steel Structures Painting Council (SSPC) as follows:

1. SP-1 "Solvent Cleaning"
2. SP-2 "Hand Tool Cleaning"
3. SP-3 "Power Tool Cleaning"
4. SP-5 "White Metal Blast Cleaning"
5. SP-6 "Commercial Blast Cleaning"
6. SP-7 "Brush-off Blast Cleaning"
7. SP-8 "Pickling"
8. All structural steel that is not specified to be painted shall be cleaned of dirt and other foreign material by sweeping or brushing and shall be cleaned of oil, grease, and grime with solvent cleaners.

C. Prime Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils, except that for steel exposed to crawl spaces provide a dry film thickness of not less than 2.5 mils. Provide full coverage of joints, corners, edges, and exposed surfaces. Apply two (2) coats of paint to surfaces that will be inaccessible after assembly or erection.
Change color of second coat to distinguish from initial coat.

D. Final Painting: Final paint coat, if any, and color shall be selected and performed in accordance with Section 09900 of the Specifications.

3.3 ERECTION:

A. General: Erector shall examine site and work areas and conditions where steelwork is to be erected and shall notify the Contractor and Architect/Engineer in writing of conditions detrimental to proper, safe, and timely execution and completion of the work.

B. Surveys: Contractor's Surveyor shall conduct Pre-Erection and Post-Erection surveys as previously described. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Structural Engineer. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Structural Engineer.

1. Erection tolerances of anchor bolts, embedded items, and all structural steel shall conform to the AISC Code of Standard Practice except where more stringent tolerances are indicated in the specifications or on the drawings.

C. Temporary Shoring and Bracing: Provide temporary shoring/bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members/connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

1. Design and provide adequate shoring and bracing to safely withstand all loads that may occur during construction. Provide additional structural members and/or increased member sizes and connections as required to accommodate erection methods and equipment. Design of all temporary shoring and bracing is the responsibility of the General Contractor.
2. Provide any temporary erection shoring, bracing, or supports required to secure structural steel in position until permanent bracing or other steel has been erected and concrete floor slabs have reached 75% of specified strength.
3. Where conflicts with other trades, finishes, or building performance will not permit temporary shoring, bracing, supports, or other erection devices or connections to be permanently left in place, the erector shall remove these items or devices as part of his work.

D. Anchor Bolts: Furnish anchor bolts/other connectors required for securing structural steel to foundations and other in-place work. Where leveling plates are not indicated or used, furnish minimum 1/8" thick steel templates and other devices as necessary for presetting bolts and other anchors to accurate locations.

1. Refer to Division 3 of these specifications for anchor bolt installation requirements in concrete, and Division 4 for masonry installation.

E. Base Plates and Bearing Plates: Clean concrete/masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates. Set loose or attached base plates and bearing plates for structural members on wedges or other adjusting devices.

1. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

2. Pack grout solidly between bearing surfaces/bases or plates to insure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

F. Slab On Grade: Do not fill in concrete slab on grade around base plates or otherwise cover base plates until after Architect/Engineer has observed installation and grouting.

G. Field Assembly: Set structural frames accurately to lines/elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Work shall be assembled securely to resist all loads, erection stresses, and wind forces at all stages of construction process, especially immediately following erection of steel columns. Provide planking/working platforms necessary to effectively complete work.

1. Clean bearing surfaces/other surfaces in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment. Level/plumb individual members of structure within specified AISC tolerances. Splice members only where indicated and accepted on shop drawings.
2. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces. Comply with AISC for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
3. Gas Cutting: Do not use gas cutting torches, reamers, or other devices in field for unauthorized correcting of fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Structural Engineer. Finish gas-cut sections equal to a sheared appearance when permitted.
4. Errors in shop fabrication or shipping damage preventing proper erection or fit-up shall be reported to the Architect/Engineer and an approved correction shall be obtained prior to proceeding with affected work.
5. Provide miscellaneous supplemental framing for metal decking support where columns, other framing members, or other openings interrupt normal deck bearing whether or not indicated on the drawings or where minimum deck bearing is inadequate for construction purposes.

H. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop painted materials. Apply paint to exposed areas using same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 1.5 mils. Apply "GALVILITE" manufactured by ZRC Worldwide, or approved equal, to all field welded galvanized connections or to galvanized members or connections where visible damage to hot-dipped galvanizing has occurred.

END OF SECTION 051200

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Extent of steel roof deck, composite steel floor deck and edge of slab light gage steel closure plates are indicated on drawings, including basic layout and type of deck units required.

1.3 QUALITY ASSURANCE:

A. Codes and Standards: Comply with all applicable provisions of state and local building and safety codes and all other codes referenced therein, other federal (OSHA) safety requirements, and other codes and standards referenced in this specification, except where more stringent requirements are indicated or specified herein.

1. AISI "Specification for Design of Cold-Formed Steel Structural Members"
2. AWS D1.3 "Structural Welding Code - Sheet Steel"
3. SDI "Standard for Composite Steel Floor Deck-Slabs"
4. SDI "Standard for Noncomposite Steel Floor Deck"
5. SDI "Standard for Steel Roof Deck"
6. SDI "Design Manual for Composite Decks, Form Decks and Roof Decks".
7. SDI "Manual of Construction with Steel Deck" (SDI - MOC2).

B. Any material or operation specified by reference to published specification of a manufacturer shall comply with requirements of standards listed herein. In case of a conflict between referenced specifications and project specifications, project specifications shall govern.

C. If requested, furnish affidavit from manufacturer or fabricator certifying that materials or products delivered to job meet requirements specified. However, such certification shall not relieve Contractor from responsibility of complying with any added requirements specified herein.

D. Qualifications for Welding Work: Contractor shall retain testing laboratory to provide qualification of welding processes and welding operators in accordance with AWS "Standard Qualification Procedure" comply with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel". Contractor shall submit for Structural Engineer's review copies of AWS certifications for each welder assigned to the job. Where re-certification of welders is required, BOTH cost and retesting will be Contractor's responsibility.

1. Welder Certification: Provide certification, either 'a' or 'b' below, that welders employed in work have as follows:

   a. Satisfactorily passed AWS qualification tests for the types of welds they will be performing based on most current AWS standards and procedures and have been continuously employed by the same Contractor since becoming certified. Or,
   b. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests for the types of welds they will be performing within previous twelve (12) months.

2. Contractor Note: Welding qualifications for Steel Decking (sheet steel) are not the same as for structural steel welding. Requirements of AWS D1.3 ARE MANDATORY. Failure to comply will result in rejection of all welding performed by unqualified welders or welding that is not explicitly identified as performed by qualified welders.
3. Welded decking in place is subject to inspection and testing by ITL. Expense of removing and replacing portions of decking for testing purposes will be borne by Owner if welds are found to be

satisfactory. Remove work found to be defective and replace with new acceptable work. Cost of such removal and replacement shall be borne by the Contractor.

1.4 INSPECTION AND TESTING:

A. Owner will employ, at his expense, a qualified independent testing laboratory (ITL) qualified according to ASTM E 329 to inspect steel decking attachment and to perform tests and prepare test reports. Reports shall be furnished directly to the Architect and Structural Engineer with copies forwarded to the Contractor.

1. ITL shall conduct and interpret tests to verify that metal decking is attached to structural frame in accordance with manufacturer's recommendations, contract documents, and approved shop drawings. Specifically, include verification that structural supporting members - structural steel (Section 051200), steel joists (Section 052100), and light gage metal framing (Section 054000) - have not been "burned through" or otherwise damaged by the attaching operations.
2. Refer to Section 05300 "Steel Decking" specifications for installation requirements.
3. Submit a written report of deck and supporting member inspection, for Structural Engineers review and approval, prior to Contractor's covering of decking surface. Report shall state whether steel decking attachment complies with requirements herein and specifically state any deviations therefrom and any damage to the supporting members attributable to steel decking attachment operations or procedures.

B. Contractor(s) shall provide access for ITL to places where steel decking work is being performed so required inspection and testing can be accomplished.

C. Contractor/Fabricator shall correct deficiencies in steel decking attachment that inspections/laboratory test reports have indicated to be not in compliance with requirements. ITL shall perform additional tests to reconfirm any non-compliance of original work as may be necessary to show compliance. Contractor will pay such tests, including additional architectural/engineering services made necessary by such non-conformance.

D. Underwriters' Label: Provide steel floor deck units listed in UL's "Fire Resistance Directory", with each deck unit bearing UL label and marking for specific system detailed.

1. Provide steel deck units identical to those tested for fire resistance per ASTM E 119.
2. Fire-Resistance Ratings designations shall be consistent with those in the tested assembly identified in the UL “Fire Resistance Directory”

E. Factory Mutual Listing: Provide steel roof deck units evaluated by Factory Mutual System and listed in Factory Mutual Approval Guide for "Class I" fire rated construction. Attachment of steel roof decking shall comply with Factory Mutual System "Class I-60" for wind uplift loading.

F. Delivery, Storage, and Handling: Protect all components during delivery, unloading and storage. Store off the ground with one end elevated for drainage. Protect from water damage by exposure or condensation.

1.5 SUBMITTALS:

A. General: Contractor shall establish and provide a mutually agreed upon “Submittal Schedule” prior to beginning transmission of submittals for review. There is no requirement for the Architect or Structural Engineer to process or review any submittals prior to this Schedule being established and distributed to all relevant parties involved in Submittal preparation, processing, and review.

1. Schedule shall identify and indicate individual packages, submittal dates, and required return dates. Dates shall be the date that the submittal is scheduled to arrive in the Structural Engineer’s office for review to begin and the date that the returned submittal is required to arrive in the Contractor’s office for distribution to his sub-contractors and fabricators.

2. Scheduled review and return of submittals/shop drawings shall be based on a MINIMUM of FIFTEEN (15) WORKING DAYS in the Structural Engineer's office from receipt of submission to return to the next party for their action.
3. Shop drawings should be submitted incrementally as appropriate packages are prepared to equalize the workload for review of the drawings and expedite the return schedule. Submission of a large volume of shop drawings at one time may result in review times that will be required to exceed those noted above. Definition of a "large volume" of shop drawings is subject to mutual interpretation.
4. Contractor shall provide in his Schedule for the above noted time and for appropriate additional time for delivery (shipping) of drawings. No claims may be made on the part of the Contractor for delay of the project due to shop drawing reviews that occur within the above stated time limits or for reviews that take greater time than noted above due to submission of a large volume of shop drawings at one time.

B. Product Data: Submit manufacturer's specifications and installation instructions for each type of decking and accessory specified. Include manufacturer's certification of product compliance with SDI standards as may be necessary to show compliance with these specifications.

C. Steel Deck Shop Drawings: Submit detailed drawings showing layout and types of deck panels, attachment details, closures, edge strips, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories. Indicate welds by standard AWS symbols and show size, length, and type each weld. Welding or fastener pattern details shall be appropriate for the manufacturer's particular product to deliver required uplift loading or diaphragm shear capacity indicated on the drawings or herein.

1. Shear Connector Shop Drawings: Submit shear connector layout which shall consist of shear connector diameter, length and installation details. Shear connector layout shall indicate number and spacing of studs consistent with deck configuration.
2. Submit full scale electronic PDF files of each shop drawing for review via email or FTP download. PDF files shall be generated from original CAD drawing files with multiple drawings contained in a single PDF file.
3. Reproducible copies of contract documents shall not be used as shop drawings without prior written indemnification with respect to items for which the Contractor alone is responsible.
4. Contractor shall employ technically competent staff to thoroughly review the shop drawings prior to submission. Shop drawings not demonstrating competent preparation or understanding of the Contract Documents both drawings and specifications (i.e. containing numerous errors and/or omissions) shall not be forwarded to the Architect/Structural Engineer but shall be returned to the source for correction following the Contractor’s review.
5. Drawings shall bear Contractor's approval stamp accepting responsibility for coordination of dimensions shown in the contract documents, quantities and coordination with other trades. Drawings not bearing Contractor's stamp or not showing evidence of being reviewed by a technically competent representative (due to the magnitude of submitted errors) may be rejected at the discretion of the Architect or Structural Engineer.
6. Shop drawings rejected due to non-compliance with the structural documents shall be resubmitted with the same time requirements for review as a new submittal as noted above. No claims may be made on the part of the Contractor for delay of the project due to shop drawings rejected due to non-compliance with the structural documents. Such delays, if they occur, shall be attributable entirely to the Contractor's Fabricator.
7. Shop drawings submitted for more than two reviews due to fabricator's non-compliance shall result in time for additional engineering services being charged to the Contractor.

D. Changes and Deviations: After submittal review, neither products nor construction requirements indicated on the shop drawings may be changed or deviated from. Changes following shop drawing review may be requested by the Contractor in writing, separate from shop drawings and shall clearly delineate requested change. Contractor shall not proceed with any requested changes until notified by Architect/Structural Engineer, in writing, of acceptability.

E. Engineer's Review: Structural Engineer's review of shop drawings will be for general considerations only. Attachment or anchoring details are subject to review by the Structural Engineer based on the properties and capacities of each manufacturer's product. Compliance with requirements for materials, fabrication, and erection is Contractor's responsibility; include details noted above and other pertinent data.

F. Insurance Certification: Assist Owner in preparation and/or submittal of roof installation acceptance certification necessary in connection with fire and extended coverage insurance.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. General: Specific yield strength (Grade) and properties for a given deck depth for all steel decks shall be sufficient to provide the minimum load carrying capacity indicated on the drawings for all span conditions.

B. Steel for Galvanized Steel Deck Units: ASTM A653, or A924 Structural Steel (SS) with Grade complying with SDI specifications with minimum yield strength of 40 ksi for floor deck and 33 ksi for roof deck (see General Notes for Fy required). C. Miscellaneous Steel Shapes: ASTM A36.

D. Shear Connectors: Headed stud type, ASTM A108, Grade 1015 or 1020, cold finished carbon steel; with dimensions complying with AISC Specifications.

E. Sheet Metal Accessories: ASTM A526, commercial quality, galvanized. Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0358-inch uncoated design thickness, of same material and finish as deck; of profile indicated or required for application.

1. Pour Stops and Girder Fillers: Galvanized G-60 minimum steel sheet, minimum yield strength of 33,000 psi of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth unless indicated otherwise on the drawings.
2. Column Closures, End Closures, Z-Closures, and Cover Plates: Galvanized G-60 minimum steel sheets, of same thickness as deck, unless otherwise indicated.
3. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598" or 0.0747" thick as required for indicated diaphragm loads, with factory-punched hole of 3/8-inch (9.5-mm) minimum diameter.

F. Galvanizing: ASTM A525, G60 or otherwise where indicated on the drawings.

G. Galvanizing Repair Paint: Provide high zinc-dust content paint for repair of damaged galvanized surfaces complying with SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight. Prepare and repair surfaces in accordance with ASTM A780.

H. Mechanical Fasteners: Corrosion-resistant, low-velocity, powder-actuated carbon-steel fasteners; or self-drilling, self-threading screws.

I. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

J. Flexible Closure Strips: Manufacturer's standard vulcanized, closed-cell, synthetic rubber.

2.2 DESIGN AND FABRICATION:

A. General: Refer to the "General Notes" on the drawings for location of metal deck types, depths, minimum deck thickness and section properties, superimposed design loads, and where applicable, concrete slab type, thickness, and reinforcing.

1. The deck manufacturer shall be responsible for selecting, for his product, the required deck thickness to safely support and meet all SDI performance criteria for the superimposed design loads and for all

spans indicated on the drawings. However, in no case shall the delivered thickness of the uncoated steel sheet be less than 95% of that indicated on the drawings.

2. Section properties of the deck units are to be calculated in conformance with the AISI publication, "Specification for Design of Cold-Formed Steel Structural Members". Steel deck shall be designed in accordance with the "Steel Deck Institute Design Manual for Composite Decks, Form Decks and Roof Decks".
3. Spans shall not exceed the maximum clear spans as specified by SDI criteria. Fabricate deck units in lengths to span three (3) or more supports with flush, telescoped or nested 2" laps at ends and interlocking or nested side laps, unless otherwise indicated.
4. Where concrete slabs are placed on steel decking, the General Contractor shall be responsible for including in his bid the additional concrete volume required to accommodate the deflection of the steel decking under the wet weight of the concrete.

B. Steel Roof Deck Units: Fabricate deck configurations complying with SDI "Specifications and Commentary for Steel Roof Deck". Fabricate deck units of steel thickness, depth and width as shown with fluted section having interlocking side laps.

1. Diaphragm Design: Steel roof deck has been designed to function as a diaphragm for the transmission of lateral loads. Roof deck shall be designed for diaphragm shear in accordance with the SDI "Diaphragm Design Manual". The deck supplier consistent with the deck properties and manufacturer's recommendations shall design connection of deck units to each other and to supports. Diaphragm shear loads are indicated on the drawings, however all steel roof deck shall be capable of transferring a minimum diaphragm shear of 200 plf. Steel deck supplier shall furnish manufacturer's data for approval.
2. Vented Deck Units: Provide deck units with vent slots in the bottoms or sides of the flutes of each corrugation of the deck. Vent slots shall provide a minimum of 1.5% open area of the projected flat surface area of the deck units.
3. Acoustical Deck Units: Provide deck units with vertical webs having 5/32" diameter perforations staggered on 3/8" centers with steel thickness, depth and width of cells as shown and or required. Provide mineral fiber acoustical insulation strips of profile to fit void spaces between vertical ribs.
4. Cellular Acoustical Deck Units: Provide cellular deck units consisting of upper fluted units, as specified above, combined with lower flat plate sections having interlocking side laps and 5/32" diameter perforations staggered on 3/8" centers under cell voids formed with upper unit. Number and width of cells per unit as indicated on the drawings. Steel thickness of upper unit and lower plate and depth and width of cells as shown and or required. Provide welded connections between upper units and lower plates to develop full horizontal shear strength where properties of "composite" steel section are utilized. Provide mineral fiber acoustical insulation strips of profile to fit void space of each cell.

C. Composite Steel Floor Deck Units: Fabricate deck units with integral embossing/raised pattern to furnish mechanical bond with concrete slabs. Fabricate deck units of steel thickness, depth and width as shown with fluted section having interlocking side laps. The average rib width to deck depth shall not be less than 2.0. All metal deck shall be designed for unshored conditions, unless indicated otherwise on the drawings. Simple span conditions are not permitted unless span is shored at mid-span.

1. Composite floor deck shall be designed to support the concrete dead load plus 20 psf construction live load without exceeding a flexural stress of 20,000 psi without shoring. Maximum deck deflection due to concrete dead load shall not exceed .006 times the span or 1/2" whichever is greater. Supplier may be required to show by calculation that the deck can carry the specified construction loads within the limitations specified. Any additional concrete topping slabs shall not be placed until the composite slab has reached 75% of the specified design strength.

D. Metal Closure Strips (Pour Stops): Fabricate metal closure strips, for cell raceways/openings between decking and other construction, of not less than 0.045" min. (18 gage) sheet steel. Fabricate metal steel cover plates for end-abutting composite deck units of not less than same thickness as decking. Form to match contour of deck units and approximately 6" wide. Form to provide tight-fitting closures at open ends of cells or flutes and sides of decking. Closures shall be designed to support the wet weight of the concrete slab without exceeding either a vertical or a lateral deflection of 1/2".

E. Roof Sump Pans: Fabricate from single piece of 0.0747" (minimum 14 gage), galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 3" wide. Recess pans not less than 1-1/2" below roof deck surface unless indicated otherwise or required by roof deck configuration. Holes for drains shall be cut in the field by others.

F. Hanger Slots: Provide UL approved punched hanger slots between cells or flutes of lower element where steel deck units are to receive hangers for support of ceiling construction, flexible air ducts, diffusers or lighting fixtures:

1. Locate slots at not more than 14" o.c. in both directions, not over 9" from walls at ends, and not more than 12" from walls at sides, unless otherwise shown.
2. Provide manufacturer's standard hanger attachment devices.
3. Loads hanging from steel deck units shall not exceed 100 pounds unless explicitly detailed on the structural drawings.
4. DO NOT hang pipes or main air duct trunk lines from steel deck units.

G. Hanger Clips: Provide UL approved hanger clips where steel deck units are to receive hangers for support of ceiling construction, flexible air ducts, diffusers or lighting fixtures:

1. Hangers may be attached to deck with powder-actuated fasteners at a minimum spacing of 36” o.c.
2. Hanger clips designed to clip over male side lap joints of floor deck units may be used.
3. Locate clips at not more than 14" o.c. in both directions, not over 9" from walls at ends, and not more than 12" from walls at sides, unless otherwise shown.
4. Provide manufacturer's standard hanger attachment devices.
5. Loads hanging from steel deck units shall not exceed 100 pounds unless explicitly detailed on the structural drawings.
6. DO NOT hang pipes or main air duct trunk lines from steel deck units.

2.3 ACCEPTABLE MANUFACTURERS:

A. Subject to compliance with requirements, manufacturers offering products include, but are not limited to, the following:

Wheeling Corrugating Co.	Epic Metals Corporation
United Steel Deck, Inc.	Vulcraft, Nucor Corp.
Consolidated Systems, Inc.	New Millennium Building Systems

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install deck units and accessories in accordance with applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, final shop drawings, and as specified herein:

1. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
2. Locate deck bundles to prevent overloading of supporting members.
3. Place units on supporting steel framework and adjust to final position with ends accurately aligned and bearing a minimum of 1 1/2" (2" minimum for steel form deck units) onto supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
4. Place units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.
5. Place units flat and square, secure to adjacent framing without warp or excessive deflection.
6. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
7. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
8. Do not place units on concrete supporting structure until concrete has cured and is dry.

9. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
10. Do not use floor deck units for storage or working platforms until permanently secured.
11. Comply with AWS requirements/procedures for manual shielded steel arc welding, appearance, and/or quality of welds, and methods used in correcting welding work. Use welding washers for all deck thinner than 22 gauge.
12. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

B. Uplift Loading: Manufacturer shall provide welding or fastener patterns required for its product to deliver required attachment, anchoring, or diaphragm shear capacity in accordance with the drawings and as indicated herein. MINIMUM attachment and anchoring of Steel Roof Deck units to supporting roof assemblies shall be to resist the greatest of:

1. Gross uplift loading of 40 psf at eave overhangs for distance of ten (10) feet in from perimeter and 30 psf for all other roof areas.
2. Minimum diaphragm shear of 200 pounds per lineal foot.
3. Diaphragm shears induced by wind, seismic, or other loading as indicated on the drawings.

C. Attachment or anchoring of decking to supporting roof assemblies shall not proceed until the Structural Engineer has reviewed welding or fastener patterns. D. Steel Roof Deck: Attach roof deck units as follows:

1. Fasten units to supporting steel members by not less than 5/8" diameter fusion welds (arc spot – i.e. puddle) or elongated welds of equal perimeter. Attachments shall be spaced not more than 12" o.c. at every support and at closer spacing where required for lateral force resistance. Welding machine power settings shall be such that burn-off rates are between 0.15 and 0.25 inches of rod per second with E60 or E70, 5/32-inch rods.

    a. Comply with AWS requirements/procedures for manual shielded steel arc welding, appearance, and/or quality of welds, and methods used in correcting welding work. Welding washers are required for all deck thinner than 22 gauge.

2. Alternatively, fasten units to supporting steel members with X-ENP-19 L15, X-EDN19 THQ12 or X-EDNK22 THQ12 Fasteners by Hilti Fastening Systems and conforming to the Hilti published installation requirements. Attachments shall be spaced not more than 12" o.c. at every support and at closer spacings where required for lateral force resistance.

    a. Minimum sidelap edge distance: 3/8"
    b. Minimum end/endlap distance: 1"

3. Provide sidelap attachments between supports with #10 Hilti self-drilling screws or larger. Hilti S-SLC01 M HWH or Hilti S-SLC02 M HWH Sidelap Connectors are permitted and may be required for additional capacity. Welding is not permitted for stitch fastening of steel deck of 22 ga. or thinner. Sidelap fasteners shall be provided at mid-span of deck between supports for any deck spans exceeding 5 feet and at closer spacings where required for lateral force resistance or where indicated on the drawings. Button punched sidelap fastening is not permitted.

E. Composite Steel Decking: Attach composite deck units as follows:

1. Fasten units to supporting steel members by not less than 3/4" diameter welds or elongated welds of equal strength, spaced not more than 12" o.c. with a minimum of two (2) welds per unit at each support, unless indicated otherwise on the drawings. Comply with AWS requirements/procedures for manual shielded steel arc welding, appearance, and/or quality of welds, and methods used in correcting welding work. Where composite beam shear connectors (headed studs) are being used each stud may substitute for one weld.

2. Alternatively, fasten units to supporting steel members with X-ENP-19 L15, X-EDN19 THQ12 or X-EDNK22 THQ12 Fasteners by Hilti Fastening Systems and conforming to the Hilti published installation requirements.
3. Fasten sidelaps with #10 Hilti self-drilling screws or larger or approved equal or welds equally spaced at a maximum of 5'-0" o.c. for all deck spans exceeding 5'-0", but in no case less than one (1) screw or weld in each deck span. Fasteners may require closer spacing for diaphragm shear resistance as noted on the drawings. Button punched sidelap fastening is not permitted.
4. Tack weld or use self-tapping No. 8 or larger machine screws at 4'-0" o.c. for fastening end closures.

F. Shear Connectors: Weld shear connectors to supports through decking units in accordance with manufacturers instructions.

1. Do not weld shear connectors through two (2) layers (lapped ends) of decking units. Weld only on clean, dry deck surfaces.
2. Break ceramic ferrules (arc shields) loose and remove from deck.
3. A stud shear connector welded through the steel deck may take the place of a 3/4" plug weld in order to secure the deck to the steel framing.

G. Metal Closure Strips (Pour Stops): Unless indicated otherwise on the drawings or where taped joints are requried, provide metal closures at all slab edges, columns, walls, other openings, where decking stops or changes direction, and in voids between decking and other construction. Provide minimum 2" bearing over steel supports. Weld into position to provide a complete decking installation. Weld closures at edge supports with welds 1" long at maximum 12" o.c., unless indicated otherwise on drawings.

H. Cutting and Fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.

I. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.2 OPENINGS AND CONCRETE SLAB REINFORCEMENT:

A. General: Provide additional metal reinforcement, concrete slab reinforcing steel and closure pieces as required for strength, continuity of decking, slabs, and support of other work shown. Where greater amounts of reinforcement than indicated on the drawings or herein are required for a particular manufacturer's product to accommodate the superimposed loads on the slab, the cost of such reinforcement and its placement shall be borne by the supplier.

1. Minimum Slab Reinforcement: Whether indicated on the drawings or not, all concrete slabs placed on steel decking shall be reinforced for temperature and shrinkage with welded wire mat (flat sheet - not rolled welded wire fabric) providing a minimum area of reinforcing steel of .00075 times the area of concrete above the top of the steel deck but in no case shall less than 6x6-W1.4xW1.4 WWM be used.

   a. Provide minimum 3/4" concrete cover for all temperature and shrinkage reinforcement using continuous high chairs manufactured specifically for steel decking (CRSI type CHCM). Locate chairs over all beams and girders and at a maximum spacing of 4'-0" o.c. for deck spans between structural steel members.
2. Composite Deck Slab Reinforcement: Provide minimum 3/4" clear support above bottom of steel deck flutes using CRSI type BC chairs for all bottom reinforcement indicated on the drawings at a maximum spacing of 4'-0" o.c. Provide minimum 3/4" concrete cover for all top reinforcement indicated on the drawings in addition to minimum temperature and shrinkage reinforcement. Use continuous high chairs manufactured for use with steel decking (CRSI type CHCM) at a maximum spacing of 4'-0" o.c.
3. Form Deck Slab Reinforcement: Place reinforcement for reinforcement structural slabs on steel form deck as follows:

a. Place reinforcement for slabs 3" or less in total thickness at mid-depth of slab above top of steel form deck. Use continuous #5 bar over each steel member supported with CRSI type HCM high chairs to support and tie slab reinforcing.
b. Place reinforcement for slabs greater than 3" in total thickness as above and provide minimum 3/4" concrete top cover over supports. Drape WWM reinforcing to top of steel form deck at mid-span of deck between supports.

4. Reinforcement at Slab Openings: At openings greater than 9" in any dimension and not indicated on the drawings nor framed with structural steel supports, provide:

a. Perpendicular to deck flutes along each side of opening one (1) #5 x 4'-0" + opening dimension. Bear on top surface of deck flutes.
b. Parallel to deck flutes along each of opening two (2) #5 x 1'-0" + deck span between supports in which opening occurs. Locate bar in bottom of flutes adjacent each side of opening and center bar in deck span. Provide a minimum of 3/4" clear support above bottom of steel deck flutes using CRSI type BC chairs.
c. Provide blockout for concrete slab opening and DO NOT cut steel deck at opening until after concrete slab has reached 75% of specified design strength.

3.3 TOUCH-UP PAINTING:

A. After decking installation, wire brush, clean and paint scarred areas, welds and rust spots on top and bottom surfaces of decking units and supporting steel members.

1. Touch-up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.

END OF SECTION 053100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Load-bearing wall framing.
   2. Exterior non-load-bearing wall framing.
   3. Roof joist framing.
   4. Exterior soffit and ceiling joist framing.

B. Related Requirements:
   1. Section 055000 "Metal Fabrications" for masonry shelf angles and connections.
   2. Section 092116 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
   3. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. Shop Drawings:
   1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
   2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel framing.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.
   1. Steel sheet.
   2. Expansion anchors.
   3. Power-actuated anchors.
   4. Mechanical fasteners.
   5. Vertical deflection clips.
   6. Horizontal drift deflection clips
   7. Miscellaneous structural clips and accessories.

D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 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. AllSteel & Gypsum Products, Inc.
   2. California Expanded Metal Products Company.
   3. ClarkWestern Building Systems, Inc.
   4. Consolidated Fabricators Corp.; Building Products Division.
   5. Craco Mfg., Inc.
   6. Custom Stud Inc.
   7. Design Shapes in Steel.
   8. Dietrich Metal Framing; a Worthington Industries Company.
   9. Formetal Co. Inc. (The).
   10. MarinoWARE.
   11. Nuconsteel; a Nucor Company.
   12. Olmar Supply, Inc.
   13. Quail Run Building Materials, Inc.
   14. SCAFCO Corporation.
   15. Southeastern Stud & Components, Inc.
   16. State Building Products, Inc.
   17. Steel Construction Systems.
   18. Steel Network, Inc. (The).
   19. Steel Structural Systems.
   20. Steeler, Inc.
   21. Super Stud Building Products, Inc.
   22. Telling Industries, LLC.
   23. United Metal Products, Inc.
   24. United Steel Manufacturing.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated on drawings.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.
   b. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height when supporting brick or cast stone, 1/360 of the wall height when supporting FRP or metal panels.
   c. Roof Joist Framing: Vertical deflection of 1/360 for live loads and l/240 for total loads of the span.
   d. Exterior Soffit and Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.
3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
   a. Upward and downward movement of 3/4 inch.
5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Design Standards:
1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: As required by structural performance.
2. Coating: G60.

C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
2. Coating: G60.

2.4 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Minimum Flange Width: 1-5/8 inches.
3. Section Properties: As required by structural performance.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
   1. Minimum Base-Metal Thickness: Matching steel studs.
   2. Minimum Flange Width: 1-1/4 inches.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Minimum Flange Width: 1-5/8 inches.
   3. Section Properties: As required by structural performance.

D. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Minimum Top Flange Width: 1-5/8 inches.
   3. Section Properties: As required by structural performance.

2.5 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Minimum Flange Width: 1-5/8 inches.
   3. Section Properties: As required by structural performance.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: Matching steel studs.
   2. Minimum Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
   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. AllSteel & Gypsum Products, Inc.
      b. ClarkWestern Building Systems, Inc.
      c. Dietrich Metal Framing; a Worthington Industries company.
      d. MarinoWARE.
      e. SCAFCO Corporation.
      f. Steel Network, Inc. (The).
      g. Steeler, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Minimum Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
   1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
      a. Minimum Base-Metal Thickness: 0.0428 inch.
      b. Minimum Flange Width: 1 inch plus the design gap for one-story structures and 1 inch plus twice the design gap for other applications.
   2. Inner Track: Of web depth indicated, and as follows:
      a. Minimum Base-Metal Thickness: 0.0428 inch.
      b. Minimum Flange Width: outer deflection track flange width plus 1 inch.

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.6 ROOF JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, unpunched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Minimum Flange Width: 1-5/8 inches.
   3. Section Properties: As required by structural performance.

B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: Matching steel joists.
   2. Minimum Flange Width: 1-1/4 inches.

2.7 EXTERIOR SOFFIT AND CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Minimum Flange Width: 1-5/8 inches.
   3. Section Properties: As required by structural performance.

2.8 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Anchor clips.
   5. End clips.
   6. Foundation clips.
   7. Gusset plates.
   8. Stud kickers and knee braces.
   9. Joist hangers and end closures.
   10. Hole reinforcing plates.
   11. Backer plates.

2.9 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.10 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

2.11 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
   1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
   2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
   1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: To match stud spacing.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Maximum Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically as indicated on Shop Drawings. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.

2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to bottom track unless otherwise indicated. Space studs as follows:
1. Maximum Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing or infill studs and anchor to building structure.
4. Connect drift clips to cold-formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
a. Install solid blocking at centers indicated on Shop Drawings.
2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 ROOF JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:
   1. Maximum Joist Spacing: 16 inches.

D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
   1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:
   1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
   2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.7 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Rooftop equipment bases and support curbs.
   2. Wood blocking and nailers.
   3. Plywood backing panels.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. 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. SPIB: The Southern Pine Inspection Bureau.

1.4 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 products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   4. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. 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. 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.
3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
   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 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.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood nailers, blocking, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood blocking 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 crawl spaces or unexcavated areas.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).
   1. Use treatment that does not promote corrosion of metal fasteners.
   2. Use Exterior type for exterior locations and where indicated.
   3. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
   4. Use Interior Type A, unless otherwise indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. 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.

D. Application: Treat all miscellaneous carpentry, unless otherwise indicated.
   1. Framing for raised platforms.
   2. Concealed blocking.
   3. Roof construction.
   4. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
   1. Eastern softwoods, No. 2 Common grade; NELMA.
D. 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.
E. 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.

2.5 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. Where 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. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
F. Lag Bolts: ASME B18.2.1.
G. Bolts: Steel bolts complying with ASTM A 307, Grade A ; with ASTM A 563 hex nuts and, where indicated, flat washers.
H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 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.

2.7 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
   1. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Do not splice structural members between supports, unless otherwise indicated.
D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
E. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. 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.
   2. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
F. 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.
G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.
H. Securely attach 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.
I. Use common wire 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; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for 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.
   1. Do not use wood blocking in fire-resistance-rated assemblies unless specifically allowed by authorities having jurisdiction.
B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 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.
B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 53

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Wood cabinets.
B. Related Sections include the following:
   1. Division 12 Section "Countertops" for countertop materials for wood cabinets and countertop installation requirements.

1.3 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.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories.
B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   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 and other items installed in architectural woodwork.
C. Samples for Initial Selection:
   1. Plastic laminates.
   2. Solid-surfacing materials.
D. Samples for Verification:
   1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with 1 sample applied to core material.
   2. Solid-surfacing materials, 6 inches square.
   3. Cabinet 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.
      c. Exposed cabinet hardware and accessories, one unit for each type.
E. Product Certificates: For each type of product, signed by product manufacturer.
F. Qualification Data: For Fabricator and Installer.
G. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 QUALITY ASSURANCE

A. 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.
B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
   1. Provide AWI Quality Certification Program certificates indicating that woodwork complies with requirements of grades specified.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 "Project Management and Coordination".

1.6 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.

1.7 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. 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.

1.8 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.

PART 2 - PRODUCTS

2.1 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. Wood Species for Opaque Finish: Black Ash, unless otherwise selected by Architect.

C. Wood Products:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
3. Particleboard: ANSI A208.1, Grade M-2.
4. Softwood Plywood: DOC PS 1, Medium Density Overlay.

2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

F. Drawer Slides: BHMA A156.9, B05091.

1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.

G. Door Locks: BHMA A156.11, E07121.

H. Drawer Locks: BHMA A156.11, E07041.

I. Grommets for Cable Passage through Countertops: 1-1/4-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.
   1. Product: Subject to compliance with requirements, provide "OG series" by Doug Mockett & Company, Inc.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Stainless Steel: BHMA 630.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. 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.

C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that 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. Contact Adhesive: 250 g/L.

E. Adhesive for Bonding Plastic Laminate: Contact cement.

F. Fastener Materials for Stainless-Steel Items: Type 316 stainless-steel fasteners.

2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard.

B. 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.

C. 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 and Rails: 1/16 inch.

D. Shop fabricate stainless steel surfaced table tops and benches to meet requirements indicated on Drawings.

E. Complete fabrication, including assembly 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. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
   2. 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.

F. 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.

2.5 PLASTIC-LAMINATE CABINETS

A. Grade: Premium.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: Grade HGS.
2. Vertical Surfaces: Grade VGS.
3. Edges: Grade VGS, to be applied before face surfaces.

D. Countertops: As specified in Division 12 Section "Countertops".

E. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade CLS.
   a. Edges of Plastic-Laminate Shelves: PVC tape, 0.018-inch minimum thickness, matching laminate in color, pattern, and finish.
   b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade CLS.
2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

F. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

G. Laminate Colors, Patterns, and Finishes: As scheduled or as selected by Architect.

PART 3 - EXECUTION

3.1 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 and backpriming.

3.2 INSTALLATION

A. 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. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

B. Countertops: Install countertops as specified in Division 12 Section "Countertops".

3.3 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 semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 40 23

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Cold-applied, emulsified-asphalt dampproofing.
B. Related Sections include the following:
   1. Division 07 Section "Cold Fluid-Applied Waterproofing" for waterproofing.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
B. Material Certificates: For each product, signed by manufacturers.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation 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

2.1 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. BASF Construction Chemicals – Building Systems; Sonneborn Brand Products.
   2. Henry Company (The).
   3. Euclid Chemical Company (The).
   4. Karnak Corporation.
   5. Meadows, W. R., Inc.
B. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
C. VOC Content: 0.25 g/L and recalculated accordingly.

2.2 MISCELLANEOUS MATERIALS

A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.
B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
C. Protection Course, Asphalt-Board Type: Premolded, 1/8-inch- thick, multi-ply, semirigid board consisting of a mineral-stabilized asphalt core sandwiched between layers of asphalt-saturated felt, and faced on 1 side with polyethylene film.
D. Patching Compound: Manufacturer's fibered mastic of type recommended by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
   1. Proceed with dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
   2. Test for surface moisture according to ASTM D 4263.

3.2 PREPARATION

A. Protection of Other Work: 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 work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.
C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
   1. Apply additional coats if recommended by manufacturer or if required to achieve coverages indicated. Allow curing and drying in accordance with manufacturer’s instructions.
B. Apply dampproofing to footings and foundation walls from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches over outside face of footing.
   1. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
   2. 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 required for embedding fabric is in addition to other coats required.
C. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls.
   1. Lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
   2. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe, and lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.
D. Apply dampproofing to provide continuous plane of protection on interior face of above-grade, exterior concrete and masonry walls unless walls are indicated to receive direct application of paint.
   1. Continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by delaying construction of intersecting walls until dampproofing is applied.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. On Concrete Foundations Walls: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, 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. On Unparged Masonry Foundation Walls: Apply primer and one trowel coat at not less than 5 gal./100 sq. ft.

C. On Backs of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft.

3.5 INSTALLATION OF PROTECTION COURSE

A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing material manufacturer's written recommendations for attaching protection course. Support protection course with spot application of trowel-grade mastic where not otherwise indicated.

3.6 CLEANING

A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION 07 11 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes traffic coatings for the following applications:
   1. Vehicular traffic.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including installation instructions.

B. Shop Drawings: For traffic coatings.
   1. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.
   2. Include plans showing layout of pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples: For each exposed product and for each color and texture specified.

D. Samples for Verification: For each type of exposed finish, prepared on rigid backing.
   1. Provide stepped Samples on backing to illustrate buildup of traffic coatings.

E. Product certificates.

F. Sample warranty.

G. Maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Source Limitations:
   1. Obtain traffic coatings from single source from single manufacturer.

C. Mockups: Build mockups to set quality standards for materials and execution.
   1. Build mockup for each traffic coating and substrate to receive traffic coatings.
   2. Size: 200 sq. ft. of each substrate to demonstrate surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
   1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that penetrate membrane have been installed.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace traffic coating that fails in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Adhesive or cohesive failures.
      b. Abrasion or tearing failures.
      c. Surface crazing or spalling.
      d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Material Compatibility: Provide primers; base-, intermediate-, and topcoat; and accessory materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.2 TRAFFIC COATING

A. Traffic Coating: Manufacturer's standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, waterproofing membrane system with integral wearing surface for vehicular traffic; according to ASTM C 957.
   1. Products: Subject to compliance with requirements, provide products by one of the following:
      a. BASF Chemical Company; Sonneborn Products.
      b. Neogard, Div. of Jones-Blair.
      c. Tremco Commercial Sealants & Waterproofing.

B. Primer: Liquid primer recommended for substrate and conditions by traffic-coating manufacturer.

C. Preparatory and Base Coats: Polyurethane or epoxy.

D. Intermediate Coat: Polyurethane or epoxy.
   1. Aggregate Content: As recommended in writing by traffic-coating manufacturer for substrate and service conditions indicated.

E. Topcoat: Polyurethane or epoxy.
   1. Aggregate Content: As recommended in writing by traffic-coating manufacturer for substrate and service conditions indicated.
   2. Color: As selected by Architect from manufacturer's full range.

F. Aggregate: Manufacturer's standard aggregate for each use indicated of particle sizes, shape, and minimum hardness recommended in writing by traffic-coating manufacturer.

G. Fire-Test-Response Characteristics: Provide traffic-coating materials with the fire-test-response characteristics as determined by testing identical products per test method below for deck type and slopes indicated by an independent testing and inspecting agency that is acceptable to authorities having jurisdiction.
   1. Class A roof covering per ASTM E 108 or UL 790.

2.3 ACCESSORY MATERIALS

A. Joint Sealants: ASTM C 920; as specified in Division 07 Section "Joint Sealants".

B. Sheet Flashing: Nonstaining sheet material recommended in writing by traffic-coating manufacturer.

C. Adhesive: Contact adhesive recommended in writing by traffic-coating manufacturer.

D. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic-coating manufacturer.

E. VOC Content: Pavement-marking paints shall have a VOC content of 150 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Clean and prepare substrates according to ASTM C 1127 and manufacturer's written instructions to produce clean, dust-free, dry substrate for traffic-coating application.
   1. Application of coating indicates acceptance of surfaces and conditions.

B. Mask adjoining surfaces not receiving traffic coatings to prevent overspray, spillage, leaking, and migration of coatings. Prevent traffic-coating materials from entering deck substrate penetrations and clogging weep holes and drains.

C. Concrete Substrates: Mechanically abrade surface to a uniform profile acceptable to manufacturer, according to ASTM D 4259. Do not acid etch.
   1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
   2. Remove concrete fins, ridges, and other projections.
   3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
   4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

3.2 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written instructions.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.3 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
   1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.

B. Apply reinforcing strip in traffic-coating system where recommended in writing by traffic-coating manufacturer.

3.4 TRAFFIC-COATING APPLICATION

A. Apply traffic coating according to ASTM C 1127 and manufacturer's written instructions.

B. Apply number of coats of specified compositions for each type of traffic coating at locations as indicated on Drawings.

C. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated; omit aggregate on vertical surfaces.

D. Cure traffic coatings.

3.5 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 18 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Concealed building insulation.
   2. Sound attenuation insulation.

1.3 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 PERFORMANCE REQUIREMENTS

A. Plenum Rating: Provide glass fiber or slag-wool-fiber/rock-wool-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
   1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm air velocity.
   2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
   1. Surface-Burning Characteristics: ASTM E 84.
   2. Fire-Resistance Ratings: ASTM E 119.
   3. Combustion Characteristics: ASTM E 136.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

A. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
   1. Manufacturers: Subject to compliance with requirements, provide one of the following:
      a. CertainTeed Corporation.
      b. Johns Manville.
      c. Knauf Fiber Glass.
      d. Owens Corning.

B. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
   1. 3-1/2 inches thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F.
   2. 3-5/8 inches thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F.
   3. 5-1/2 inches thick with a thermal resistance of 21 deg F x h x sq. ft./Btu at 75 deg F.
   4. 6-1/2 inches thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F.
   5. 9-1/2 inches thick with a thermal resistance of 30 deg F x h x sq. ft./Btu at 75 deg F.

2.2 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER BLANKET INSULATION

A. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
   1. Manufacturers: Subject to compliance with requirements, provide one of the following:
      a. Fibrex Insulations Inc.
      b. Owens Corning.
      c. Thermafiber.

B. Where slag-wool-fiber/rock-wool-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt form with thermal resistances indicated:
   1. 1-1/2 inches thick with a thermal resistance of 6 deg F x h x sq. ft./Btu at 75 deg F.
   2. 3-1/2 inches thick with a thermal resistance of 13 deg F x h x sq. ft./Btu at 75 deg F.
   3. 4 inches thick with a thermal resistance of 16 deg F x h x sq. ft./Btu at 75 deg F.
   4. 5-1/4 inches thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F.
   5. 6 inches thick with a thermal resistance of 22 deg F x h x sq. ft./Btu at 75 deg F.

2.3 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

2.4 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:
   1. Plate: Perforated galvanized carbon-steel sheet, 0.030-inch-thick by 2 inches square.
   2. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
D. 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.
E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. 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.
B. Install mineral-fiber insulation 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 cavity, 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 clearance of insulation around recessed lighting fixtures.
   4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

3.5 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Install 3-inch-thick, unfaced slag-wool-fiber/rock-wool-fiber blanket insulation over suspended ceilings at partitions in a width that extends insulation 48 inches on either side of partition.

3.6 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. 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

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes factory-formed and field-assembled standing-seam metal roof panels.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product specified.

B. Shop Drawings: 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.

C. Samples: For exposed finishes on each type of metal panel indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. 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.

C. 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 as shown on Drawings; approximately 48 inches 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.

1.8 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. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. 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.

D. Retain strippable protective covering on metal panels during installation.

1.9 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.

1.10 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.

1.11 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. 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. Finish Warranty Period: 20 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

2.1 PERFORMANCE REQUIREMENTS

A. Energy Performance: Provide roof panels that are listed on the EPA/DOE's ENERGY STAR "Roof Product List" for steep-slope roof products.

B. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E 283 at the following test-pressure difference:
   1. Test-Pressure Difference: Positive and negative 1.57 lbf/sq. ft.

C. Water Penetration: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
   1. Test-Pressure Difference: 2.86 lbf/sq. ft.

D. Wind-Uplift Resistance: Provide custom-fabricated sheet metal roofing capable of resisting design negative uplift pressure indicated on Drawings. Provide clips, fasteners, and clip spacings of type indicated and with capability to sustain, without failure, a load equal to 3 times the design negative uplift pressure.

E. Seismic Performance: Provide metal roof panel assemblies capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

F. 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, ambient; 180 deg F, material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS

A. General: 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 E 1514.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. CENTRIA Architectural Systems.
      b. Dimensional Metals, Inc.
      c. MBCI; a division of NCI Building Systems, L.P.
      d. McElroy Metal, Inc.
   2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

3. Clips: Two-piece floating to accommodate thermal movement.
   a. Material: 0.028-inch- nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
4. Joint Type: As standard with manufacturer.
5. Panel Coverage: 18 inches.
6. Panel Height: 2.0 inches.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils 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 D 1970.
   2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
   3. Products: Subject to compliance with requirements, provide one of the following:
      a. GCP Applied Technologies, Inc. (formerly Grace Construction Products); Ice and Water Shield HT.
      b. Henry Company; Blueskin PE200 HT.
      c. Owens Corning; WeatherLock Metal High Temperature Underlayment.

B. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.

C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 coating designation or ASTM A 792/A 792M, Class AZ50 coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. 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. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. 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.

D. Gutters and Downspouts: Refer to requirements of Division 07 Section "Sheet Metal Flashing and Trim." Match finish requirements for metal roof panels in this Section.

E. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating.
   1. Fasteners for Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM or neoprene sealing washer.
   2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
   3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

G. Panel Sealants:
   1. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.

H. Thermal Insulation: Faced, Polyisocyanurate Board Insulation: ASTM C 1289, Type II (glass-fiber mat facing), Grade III, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, based on tests performed on unfaced core.

I. Snow Guards: Prefabricated, noncorrosive units designed to be installed without penetrating metal roof panels, and complete with predrilled holes, clamps, or hooks for anchoring.
   1. Seam-Mounted, Stop-Type Snow Guards: Cast-aluminum stops designed for attachment to vertical ribs of standing-seam metal roof panels with stainless-steel set screws.
      a. Available Products:
         1) Alpine Snow Guards, Div. of Vermont Slate & Copper Services, Inc.; Model No. 30.
         2) Berger Bros. Co.; Snow Guards.
         3) Polar Blox; Standing Seam Snowguard.

2.5 FABRICATION

A. General: 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. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. 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.

D. 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.

2.6 FACTORY FINISHING

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF resin by weight in color coat.
   1. Color and Gloss: As selected by Architect from manufacturer's standard colors.
   2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of work.
   1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
   2. 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.
   3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

B. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment and building-paper slip sheet on roof sheathing under metal roof panels, unless otherwise recommended by metal roof panel manufacturer. Use adhesive for temporary anchorage, where possible, to minimize use of mechanical fasteners under metal roof panels. Apply at locations indicated below, in shingle fashion to shed water, with lapped joints of not less than 2 inches.
   1. Apply on roof not covered by self-adhering sheet underlayment. Lap edges of self-adhering sheet underlayment not less than 3 inches, in shingle fashion to shed water.

B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment; wrinkle free, on roof sheathing under metal roof panels. Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply at locations indicated below, in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
   1. Roof perimeter for a distance up from eaves of 36 inches Insert dimension beyond interior wall line.

2. Valleys, from lowest point to highest point, for a distance on each side of 18 inches. Overlap ends of sheets not less than 6 inches.
3. Rake edges for a distance of 18 inches.
4. Hips and ridges for a distance on each side of 12 inches.
5. Roof to wall intersections for a distance from wall of 18 inches.

C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Division 07 Section "Sheet Metal Flashing and Trim."

3.4 METAL PANEL INSTALLATION

A. 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 end lap, sealed with sealant and fastened together by interlocking clamping plates.
5. Field cutting of metal roof panels by torch is not permitted.

B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

C. Snow Guards: Install snow guards in compliance with manufacturer’s written installation instructions.

D. 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.

3.5 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. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 07 41 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following sheet metal flashing and trim:
   1. Manufactured reglets.
   2. Formed low-slope roof flashing and trim.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. 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.

C. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.4 SUBMITTALS

A. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
   1. Identify material, thickness, weight, and finish for each item and location in Project.
   2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
   3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
   4. Details of expansion-joint covers, including showing direction of expansion and contraction.

B. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.
   1. 8-inch square Samples of specified sheet materials to be exposed as finished surfaces.

1.5 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockup of typical exposed flashing condition, approximately 48 inches long, including supporting construction cleats, seams, attachments and accessories. Coordinate with mockup requirements of separate sections in Divisions 04, 07 and 08.
   2. 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.

3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Preinstallation Conference: Conduct conference at Project site in compliance with Division 01 Section "Project Management and Coordination".

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
   1. As-Milled Finish: One-side bright mill finish.

B. Exposed Coil-Coated Finishes
   1. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.
      a. Color: As selected by Architect from manufacturer's full range.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed; 2B (bright, cold rolled) finish.

2.2 UNDERLAYMENT MATERIALS

A. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.

B. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

C. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils 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.
   1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
   2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.

D. Slip Sheet: Building paper, rosin-sized, minimum 3-lb/100 sq. ft.

2.3 MISCELLANEOUS MATERIALS

A. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
   1. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.

2. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
3. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
4. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
5. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

B. Solder:
1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.

C. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

D. Elastomeric Sealant: ASTM C 920, elastomeric siliconepolymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated.
1. Manufacturers: Subject to compliance with requirements, provide one of the following:
a. Cheney Flashing Company, Inc.
b. Fry Reglet Corporation.
c. Hickman, W. P. Company.
2. Material: Aluminum, 0.032 inch thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
5. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
6. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.5 FABRICATION, GENERAL

A. General: Custom 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 item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
   1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" and FMG Loss Prevention Data Sheet 1-49 for application but not less than thickness of metal being secured.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS
A. Base Flashing: Fabricate from the following material:
   1. Aluminum: 0.040 inch thick.
B. Counterflashing: Fabricate from the following material:
   1. Aluminum: 0.0320 inch thick.
C. Flashing Receivers: Fabricate from the following material:
   1. Aluminum: 0.0320 inch thick.

2.7 FINISHES
A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
C. 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 the same piece are not acceptable. 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

3.1 EXAMINATION
A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
   1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL
A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Torch cutting of sheet metal flashing and trim is not permitted.
B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.
   1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.

2. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

1. Aluminum: Use aluminum or stainless-steel fasteners.

H. Seal joints with elastomeric sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

I. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.

1. Secure in a waterproof manner by means of snap-in installation and sealant or lead wedges and sealant.

D. Roof Penetration Flashing: Refer to Division 07 roof membrane section.

3.4 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Reglets: Installation of reglets is specified in Division 4 Section "Unit Masonry Assemblies."

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following manufactured roof specialties:
   1. Copings.
   2. Roof edge flashings.
   3. Roof edge drainage systems.

1.3 PERFORMANCE REQUIREMENTS

A. General: Manufacture and install manufactured roof specialties to resist thermally induced movement and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. FMG Listing: Manufacture and install copings and roof edge flashings that are listed in FMG's "Approval Guide" and approved for Windstorm Classification, Class 1-90. Identify materials with FMG markings.

C. Thermal Movements: Provide manufactured roof specialties that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. 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.

D. Water Infiltration: Provide manufactured roof specialties that do not allow water infiltration to building interior.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show layouts of manufactured roof specialties, including plans and elevations. Identify factory- vs. field-assembled work. Include the following:
   1. Details for fastening, joining, supporting, and anchoring manufactured roof specialties including fasteners, clips, cleats, and attachments to adjoining work.
   2. Details for expansion and contraction.

C. Samples: For each type of exposed factory-applied color finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, verifying compliance of copings and roof edge flashings with performance requirements.

E. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.6 COORDINATION

A. Coordinate installation of manufactured roof specialties with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.7 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace manufactured roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers.
   1. ATAS International, Inc.
   2. Cheney Flashing Company.
   3. Hickman, W. P. Company.
   4. Metal Roofing Systems, Inc.
   5. MM Systems Corporation.
   6. Petersen Aluminum Corp.

2.2 EXPOSED METALS

A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and finish indicated, finished as follows:
   1. Surface: Smooth, flat finish.
   2. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF resin by weight in color coat.
      a. Color: As selected by Architect.

2.3 CONCEALED METALS

A. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for use and structural performance indicated, mill finished.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

D. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

C. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

E. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

F. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.

G. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
1. Slip Sheet: Rosin-sized paper, minimum 3 lb/100 sq. ft..

2.5 COPINGS

A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding 12 feet, concealed anchorage, concealed splice plates with same finish as coping caps, mitered corner units, and end cap units.
1. Coping Caps: Face leg hooked to continuous cleat with back leg fastener exposed, fabricated from the following exposed metal:
a. Aluminum: 0.050 inch thick.
2. Corners: Continuously welded.
3. Snap-on Coping Anchor Plates: Concealed, galvanized steel sheet, 12 inches wide, 0.028 inch thick, with integral cleats.
4. Face Leg Cleats: Concealed, continuous galvanized steel sheet.

2.6 ROOF EDGE FLASHINGS

A. Roof Edge Fascia: Manufactured, two-piece, roof edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed- or extruded-aluminum anchor bar with integral drip edge cleat to engage fascia cover. Provide matching mitered and welded corner units.
1. Fascia Cover: Fabricated from the following exposed metal:
a. Formed Aluminum: 0.050 inch thick.
2. Fascia Cover Color: As selected by Architect from manufacturer's full range.

3. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
4. Fascia Accessories: Wall cap.

B. Gravel Stops: Manufactured, one-piece, formed-metal gravel stop in section lengths not exceeding 12 feet, with a horizontal flange and vertical leg fascia terminating in a drip edge, continuous hold-down cleat, and concealed splice plates of same material, finish, and shape as gravel stop. Provide mitered and welded or soldered corner units.
1. Fabricate from the following exposed metal:
   a. Aluminum: 0.050 inch thick.
2. Color: As selected by Architect from manufacturer's full range.
3. Accessories: Fascia extenders with continuous hold-down cleats.

2.7 ROOF EDGE DRAINAGE SYSTEMS

A. Gutters and Downspouts: Manufactured formed gutter in uniform section lengths not exceeding 12 feet, with mitered and welded or soldered corner units, end caps, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front gutter rim. Furnish with flat-stock gutter straps and gutter support brackets and expansion joints and expansion-joint covers fabricated from same metal as gutters.
1. Fabricate gutter from the following exposed metal:
   a. Aluminum: 0.040 inch thick.
2. Gutter Style: In shape and size indicated on Drawings and in accordance to SMACNA's "Architectural Sheet Metal Manual."
3. Applied Fascia Cover: Exposed, formed aluminum, 0.040 inch thick, with mitered corners, end caps, and concealed splice joints.
4. Gutter Accessories: Continuous removable leaf screen with sheet metal frame and wire ball downspout strainer.
5. Downspouts: Rectangular with mitered elbows, manufactured from the following exposed metal. Furnish wall brackets, from same material and finish as downspouts, with anchors.
   a. Formed Aluminum: 0.040 inch thick.

B. Conductor Heads: Manufactured conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes, exterior flange trim.
1. Fabricate conductor heads from the following exposed metal:
   a. Aluminum: 0.0320 inch thick.

2.8 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. 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 the same piece are not acceptable. 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 (Not Applicable)

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of work.
   1. Examine walls, roof edges, and parapets for suitable conditions for manufactured roof specialties.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install manufactured roof specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.
   1. Install manufactured roof specialties with provisions for thermal and structural movement.
   2. Torch cutting of manufactured roof specialties is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of uncoated aluminum manufactured roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing exposed-to-view components of manufactured roof specialties directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
   3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Install manufactured roof specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.

D. Install manufactured roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.

E. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties. Space movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or intersections.

F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

G. Seal joints with elastomeric sealant as required by manufacturer of roofing specialties.

3.3 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings to resist uplift and outward forces according to performance requirements.

1. Interlock face and back leg drip edges into continuous cleats anchored to substrate at 16-inch centers.
2. Interlock face leg drip edge into continuous cleat anchored to substrate at 16-inch centers. Anchor back leg of coping with screw fasteners and elastomeric washers at 16-inch centers.

3.4 ROOF EDGE FLASHING INSTALLATION

A. Install cleats, cant dams, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings to resist uplift and outward forces according to performance requirements.

3.5 ROOF EDGE DRAINAGE SYSTEM INSTALLATION

A. General: Install gutters, downspouts and conductor heads to produce a complete roof drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Gutters: Join and seal gutter lengths. Attach gutters to firmly anchored gutter brackets or straps spaced not more than 36 inches apart. Slope gutters to downspouts.
1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.
2. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
1. Provide elbows at base of downspout to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

D. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below scupper or gutter discharge.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as manufactured roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. Replace manufactured roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 71 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following manufactured roof specialties:
   1. Roof curbs.
   2. Equipment supports.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for roof accessories.

C. Samples: For each type of exposed factory-applied color finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.

1.4 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

A. Prepainted, Metallic-Coated Steel Sheet: Steel sheet metallic coated by hot-dip process and prepainted by coil-coating process to comply with ASTM A 755/A 755M.
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coated.
   2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coated.
   3. Exposed Finishes: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight.

B. Aluminum Sheet: ASTM B 209, alloy and temper recommended by manufacturer for type of use and finish. Coil-coat finish as follows:
   1. High-Performance Organic Finish: Manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight.
      a. Color and Gloss: As selected by Architect from manufacturer’s full range.

2.2 ROOF CURBS

A. Roof Curbs: Provide metal roof curbs, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Fabricate with welded or sealed mechanical corner joints, with stepped integral metal cant raised the thickness of roof insulation and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
   1. Manufacturers: Subject to compliance with requirements, provide one of the following:
      a. LM Curbs.
      b. ThyCurb; Div. of Thybar Corporation.
      c. Uni-Curb, Inc.

2. Load Requirements: As indicated.
3. Material: Galvanized steel sheet, 0.079 inch thick.
   a. Finish: High-performance organic coating.
4. Liner: Same material as curb, of manufacturer's standard thickness and finish.
5. Factory install wood nailers at tops of curbs.
6. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
7. Factory insulate curbs with 1-1/2-inch- thick, glass-fiber board insulation.
8. Curb height may be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
9. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

2.3 EQUIPMENT SUPPORTS

A. Equipment Supports: Provide metal equipment supports, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported. Fabricate with welded or sealed mechanical corner joints, with stepped integral metal cant raised the thickness of roof insulation and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.
   1. Manufacturers: Subject to compliance with requirements, provide one of the following:
      a. LM Curbs.
      b. ThyCurb; Div. of Thybar Corporation.
      c. Uni-Curb, Inc.
   2. Load Requirements: As indicated.
   3. Material: Galvanized steel sheet, 0.079 inch thick.
      a. Finish: High-performance organic coating.
   4. Factory-install continuous wood nailers 3-1/2 inches wide at tops of equipment supports.
   5. Metal Counterflashing: Manufacturer's standard removable counterflashing, fabricated of same metal and finish as equipment support.
   6. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
   7. Fabricate units to minimum height of 12 inches, unless otherwise indicated.
   8. Sloping Roofs: Where slope of roof deck exceeds 1:48, fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
   1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
   2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
   3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
E. Seal joints with elastomeric or butyl sealant as required by manufacturer of roof accessories.

END OF SECTION 07 72 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes penetration firestopping for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
   1. Floors.
   2. Roofs.
   3. Walls and partitions.

1.3 PERFORMANCE REQUIREMENTS

A. General: For the following constructions, provide penetration firestopping that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
   1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
   2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
   3. Fire-resistance-rated floor assemblies.
   4. Fire-resistance-rated roof assemblies.

B. F-Rated Systems: Provide penetration firestopping with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

C. T-Rated Systems: For the following conditions, provide penetration firestopping with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
   1. Penetrations located outside wall cavities.
   2. Penetrations located outside fire-resistive shaft enclosures.
   3. Penetrations located in construction containing fire-protection-rated openings.
   4. Penetrating items larger than 4-inch- diameter nominal pipe or 16 sq. in. in overall cross-sectional area.

D. For penetration firestopping exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
   1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant penetration firestopping.
   2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
   3. For penetrations involving insulated piping, provide penetration firestopping not requiring removal of insulation.

E. For penetration firestopping exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.4 SUBMITTALS

A. Product Data: For each type of penetration firestopping product indicated.

B. Shop Drawings: For each penetration firestopping, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.
   1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each penetration firestopping configuration for construction and penetrating items.
   2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer.

C. 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.

D. Product Certificates: Signed by manufacturers of penetration firestopping products certifying that products furnished comply with requirements.

E. Product Test Reports: From a qualified testing agency indicating penetration firestopping complies with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is qualified by having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its penetration firestopping products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.
   1. Installer shall be certified by Factory Mutual Global or by the qualified manufacturer of firestop system materials listed in Part 2.

B. Source Limitations: Obtain penetration firestopping from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide penetration firestopping that comply with the following requirements and those specified in "Performance Requirements" Article:
   1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
   2. Penetration firestopping are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:
      a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
      b. Penetration firestopping correspond to those indicated by reference to penetration firestopping designations listed by the following:
         1) UL in "Fire Resistance Directory."

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 “Project Management and Coordination”.
   1. Before installation of fire-resistance-rated assemblies and penetrating items, review penetration firestopping and examine procedures for ensuring quality of installed systems.
   2. Require representatives of each entity directly concerned with penetration firestopping to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for penetration firestopping.
      c. Penetration firestopping Manufacturer’s service representative.
      d. Penetration firestopping Installer.
      e. Fire- resistance-rated masonry Installer.
      f. Fire- resistance-rated gypsum board assembly Installer.

g. Mechanical piping Installer.
h. HVAC ductwork Installer.
i. Electrical wireway Installer.

3. Review inspection and testing and inspecting agency procedures for field quality control, penetration firestopping installation, and coordination of penetrating item configurations with available rated penetration firestopping assemblies.

E. Provide "Rated Penetration Label Requirements" label at the end of this Section on all rated penetrations.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver penetration firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle materials for penetration firestopping to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate penetration firestopping per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's inspecting agency at least seven days in advance of penetration firestopping installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up penetration firestopping installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hilti Construction Chemicals, Inc.
2. Specified Technologies Inc.
3. 3M Fire Protection Products.

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide penetration firestopping that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating penetration firestopping, under conditions of service and application, as demonstrated by penetration firestopping manufacturer based on testing and field experience.

B. Accessories: Provide components for each penetration firestopping that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by penetration firestopping manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:
   a. Slag-/rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with written recommendations of firestop system manufacturer and the following requirements:
   1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
   2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form-release agents from concrete.
B. Priming: Prime substrates where recommended in writing by penetration firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 PENETRATION FIRESTOPPING INSTALLATION

A. General: Install penetration firestopping to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect penetration firestopping in accordance with ASTM E 2174 and to prepare test reports.
   1. Inspecting agency will state in each report whether inspected penetration firestopping comply with or deviate from requirements.

B. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued.

C. Where deficiencies are found, repair or replace penetration firestopping so they comply with requirements.

3.5 IDENTIFICATION

A. Provide "Rated Penetration Label Requirements" label at the end of this Section on all rated penetrations.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure penetration firestopping are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated penetration firestopping immediately and install new materials to produce penetration firestopping complying with specified requirements.

Rated Penetration Label Requirements

Do Not Disturb

Fire Resistance Rated Firestop System
Removing or tampering may affect system performance

Tested System Number: _____

Engineering Judgement Number: _____

Sealant Manufacturer: _____

Firestop Contractor: _____

Address: _____

Contact: _____

Phone Number: _____

General Contractor name, Logo & contact information

END OF SECTION 07 84 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes fire-resistive joint systems as indicated on Drawings.

B. Related Sections include the following:

1. Division 07 Section "Penetration Firestopping" for systems installed in openings in walls and floors with and without penetrating items.
2. Division 07 Section "Joint Sealants" for non-fire-resistive joint sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: For joints in the following constructions, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed:

1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
3. Fire-resistance-rated floor assemblies.

B. Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equaling or exceeding fire-resistance rating of constructions in which joints are located, as determined by UL 2079.

1. Load-bearing capabilities as determined by evaluation during the time test.

C. Fire Resistance of Perimeter Fire-Containment Systems: Integrity and insulation ratings indicated as determined by UL 2079.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Certificates: For each type of fire-resistive joint system, signed by product manufacturer.

C. Shop Drawings: For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

D. Qualification Data: For Installer.

E. Research/Evaluation Reports: For each type of fire-resistive joint system.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is qualified by having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its fire-resistive joint systems products to Contractor or to an installer engaged by Contractor does not in itself confer qualification on buyer.

1. Installer shall be certified by Factory Mutual Global or by the qualified manufacturer of fire-resistive joint systems materials listed in Part 2.

B. Source Limitations: Obtain fire-resistive joint systems for each kind of joint and construction condition indicated through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in "Performance Requirements" Article:
   1. Fire-resistive joint systems are identical to those tested per UL 2079. Perimeter fire-containment systems are identical to those tested per both UBC Standard 26-9 and UL 2079. Provide rated systems complying with the following requirements:
      a. Fire-resistive joint systems correspond to those indicated by referencing system designations listed by the following:
         1) UL in its "Fire Resistance Directory."

D. Preinstallation Conference: Refer to requirements of 07 Section “Penetration Firestopping.”

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Hilti Construction Chemicals, Inc.
   2. Specified Technologies Inc.
   3. 3M Fire Protection Products.

2.2 FIRE-RESISTIVE JOINT SYSTEMS, GENERAL

A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

B. Accessories: Provide components of fire-resistive joint systems, including forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

2.3 PERIMETER FIRE-CONTAINMENT SYSTEMS

A. Where UL-classified perimeter fire-containment systems are indicated, they refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHDG.

B. Perimeter Fire-Containment System:

1. UL-Classified Products:
   a. CW-S-1003
   b. CW-S-2003
2. Integrity Rating: 2 hours.
3. Insulation Rating: 1/4 hour.
4. Linear Opening Width: 2-1/2 inches, maximum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect fire-resistive joint systems and to prepare inspection reports.
   1. Inspecting agency will state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.

B. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and inspecting agency has approved installed fire-resistive joint systems.

C. If deficiencies are found, repair or replace fire-resistive joint systems so they comply with requirements.

D. Provide "Rated Penetration Label Requirements" label at the end of this Section on all rated penetrations.

3.5 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

Rated Penetration Label Requirements

Do Not Disturb

Fire Resistance Rated Firestop System
Removing or tampering may affect system performance

Tested System Number: _____

Engineering Judgement Number: _____

Sealant Manufacturer: _____

Firestop Contractor: _____

Address: _____

Contact: _____

Phone Number: _____

General Contractor name, Logo & contact information

END OF SECTION 07 84 46

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes joint sealants for the following applications, including those specified by reference to this Section:
   1. Exterior and Interior joints in vertical surfaces and horizontal nontraffic surfaces.
   2. Exterior and Interior joints in horizontal traffic surfaces.
   3. Joints in glazed nontraffic surfaces.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

E. Qualification Data: For testing agency.

F. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.

G. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

H. Field Test Report Log: For each elastomeric sealant application.

I. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

J. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

B. Environmental Limitations: Do not proceed with installation of joint sealants when ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F.

1.6 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 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 sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that 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.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Single-component, neutral-curing silicone sealant, ASTM C 920, Type S; Grade NS; Class 100/50; for Use NT.
   1. Products:
      a. Dow Corning Corporation; 790.
      b. Momentive (formerly GE Advanced Materials) - Silicones; SilPruf LM SCS2700.
      c. Pecora 890NST/890FTS.
      d. Tremco; Spctrem 1.

F. Single-component, neutral-curing silicone sealant, ASTM C 920, Type S; Grade NS; Class 50; for Use NT.
   1. Products for Glazing:
      a. Dow Corning Corporation; 795.
      b. Momentive (formerly GE Advanced Materials); 2000.
      c. Pecora 895NST.

G. Multicomponent, nonsag, urethane sealant, ASTM C 920, Type M, Grade NS, Class 25, for Use T.
   1. Products:
      a. Pecora Corporation; Dynatred.
      b. Sika Corporation, Construction Products Division; Sikaflex - 2c NS.
      c. Tremco Incorporated; Vulkem 227.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
   1. Products:
      a. Pecora Corporation; AC-20+.
      b. Schnee-Morehead, Inc.; SM 8200.
      c. Tremco Incorporated; Tremflex 834.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Products:
      a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
      b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2.6 PREFORMED JOINT SEALANTS

A. Preformed Silicone Sealant System: Manufacturer’s standard consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
   1. Products:
      a. Dow Corning Corporation; 123 Silicone Seal.
      b. Momentive (formerly GE Silicones); UltraSpan US1100.
      c. Pecora Corporation; Sil-Span.

2.7 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin); Type B (bicellular material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION
A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
C. Install sealant backings of type recommended by manufacturer to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint configuration per Figure 8A in ASTM C 1193, unless otherwise indicated.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
   1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
   2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
   3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
   4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, 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.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT SEALANT SCHEDULE

A. General: Provide Joint-Sealant Applications as applicable for conditions indicated on Drawings.

B. Joint-Sealant Application: Exterior vertical control and expansion joints in unit masonry, exterior joints in vertical surfaces, and horizontal nontraffic surfaces.
   1. Joint Sealant: Single Component silicone sealant.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

C. Joint-Sealant Application: Joints in glazed nontraffic surfaces.
   1. Joint Sealant: Single Component nonsag silicone sealant.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

D. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
   1. Joint Sealant: Multicomponent nonsag urethane sealant.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

E. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Sealant: Acoustical sealant.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces, interior perimeter joints of exterior openings, and perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
   1. Joint Sealant: Latex sealant.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 07 92 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Hollow-metal steel doors.
   2. Hollow-metal steel frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance and temperature-rise ratings, and finishes for each type of steel door and frame specified.

B. Shop Drawings: In addition to requirements below, provide a schedule of standard steel doors and frames using same reference numbers for details and openings as those on Drawings:
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details.
   3. Details and locations of door reinforcement and preparations for hardware.
   4. Frame details for each frame type, including dimensioned profiles.
   5. Details of each different wall opening condition.
   6. Details of conduit and preparations for electrified door hardware and controls.

C. Coordination Drawings: Drawings of each opening, including door and frame, drawn to scale and coordinating door hardware. Show elevations of each door design type, showing dimensions, locations of door hardware, and preparations for power, signal, and electrified control systems.

D. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

C. Fire-Rated Door, Sidelight, and Transom Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.
   1. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.
   1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 COORDINATION

A. Coordinate installation of anchorages for standard steel frames. 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Amweld Building Products, LLC.
   2. Ceco Door Products; an ASSA ABLOY Group Company.
   3. Karpen Steel Custom Doors & Frames.
   4. Steelcraft; an Ingersoll-Rand Company.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A60 zinc-iron-alloy (galvannealed) coating designation.

D. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching standard steel door frames of type indicated.

G. Grout: Comply with ASTM C 476, with a slump of 4 inches for standard steel door frames built into concrete or masonry, as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD STEEL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.
   1. Design: Flush panel.
   2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
      a. Fire Door Core: As required to provide fire-protection ratings indicated.
      b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
         1) Locations: Exterior doors, where indicated.
   3. Vertical Edges for Single-Acting Doors: Beveled edge.
      a. Beveled Edge: 1/8 inch in 2 inches.
   4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick end closures or channels of same material as face sheets.
   5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
   1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless) 0.053-inch thick faces.

C. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:
   1. Hinges: Minimum 0.123-inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
   2. Pivots: Minimum 0.167-inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
   3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
   4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.
   1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
   2. Frames for Level 3 Steel Doors: 0.067-inch- thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.
   1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
   2. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
   3. Frames for Level 2 Steel Doors: 0.067-inch- thick steel sheet.

4. Frames for Wood Doors: 0.053-inch-thick steel sheet.
5. Frames for Wood Doors with Closers: 0.067-inch- thick steel sheet.

D. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:
1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

E. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

F. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

G. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

H. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

I. Ceiling Struts: Minimum 3/8-inch-thick by 2-inch- wide steel.

2.5 STOPS AND MOLDINGS

A. Fixed Frame Moldings: Formed integral with standard steel frames, minimum 5/8 inch high, unless otherwise indicated.

2.6 FABRICATION

A. General: Fabricate standard steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Standard Steel Doors:
1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

C. Standard Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints; fabricated from same material as door frame. Fasten members at crossings and to jambs by butt-welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
4. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.

5. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
7. 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. and as follows:
      1) Two anchors per jamb up to 60 inches in height.
      2) Three anchors per jamb from 60 to 90 inches in height.
      3) Four anchors per jamb from 90 to 120 inches in height.
      4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 120 inches in height.
   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. and as follows:
      1) Three anchors per jamb up to 60 inches in height.
      2) Four anchors per jamb from 60 to 90 inches in height.
      3) Five anchors per jamb from 90 to 96 inches in height.
      4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.
      5) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
8. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated 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. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
   2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

2.7 STEEL FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Finish standard steel door and frames after assembly.

B. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
   1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than.
   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of standard steel doors and frames.
   1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
   2. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory.
B. Prior to installation, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
B. Standard Steel Frames: Install standard steel frames for doors, sidelights, transoms, borrowed lights, and other openings, of size and profile indicated. Comply with SDI 105.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire-protection-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Install frames with removable glazing stops located on secure side of opening.
      d. Install door silencers in frames before grouting.

e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 04 Section "Unit Masonry."
5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
6. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Standard Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Standard Steel Doors:
   a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3.4 ADJUSTING AND CLEANING

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 standard steel doors or frames that are warped, bowed, or otherwise unacceptable.
B. Clean grout and other bonding material off standard steel doors and frames immediately after installation.
C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
D. Galvannealed Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes solid-core doors as follows:
   1. Doors with wood-veneer faces and factory finishing.
   2. Factory fitting wood doors to frames and factory machining for hardware.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details; location and extent of hardware blocking; requirements for veneer matching; factory finishing; fire ratings; and other pertinent data.

C. Samples: For each face material and finish showing manufacturer’s full range of colors.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors from single manufacturer.

B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

C. Fire-Rated Wood Doors: Doors that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated.
   1. Test Pressure: After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
   1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
   2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
      a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Algoma Hardwoods Inc.
   2. Buell Door Company.
   3. Eggers Industries; Architectural Door Division.
   4. GRAHAM Manufacturing Corp.
   5. Lambton Doors.
   6. Marshfield Company.

7. Mohawk Flush Doors, Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Fire-Protection-Rated Doors: 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 formed-steel edges and astragals with intumescent seals.
      a. Finish steel edges and astragals to match door hardware (locksets or exit devices).

2.3 FLUSH WOOD DOORS

A. Doors for Transparent Finish: AWI Premium grade.
   1. Faces: Grade A.
   2. Veneer Matching: Book assembly on veneer leaves on door faces; center balance match.
   3. Species and Cut: White Oak and quarter-cut stained.
   4. Pair and Set Match (if applicable): Provide for doors hung in same opening or separated only by mullions.

B. Interior Veneer-Faced Solid-Core Doors: Seven-ply cores.

C. Provide blocking in particleboard cores or provide structural composite lumber cores for doors with closers, exit devices and kick plates.

D. Interior Veneer-Faced Solid-Core Doors:
   1. Core: Particleboard ANSI A208.1, Grade LD-2.
   2. Construction: Seven plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.
   3. Stiles: Applied wood edges of same species as faces and covering edges of crossbands.

E. Provide doors with structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated.

2.4 FABRICATION

A. Fabricate doors in sizes indicated for Project-site fitting.

B. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

C. Factory machine doors for hardware that is not surface applied.

2.5 FACTORY FINISHING

A. General: Finish doors at factory.

B. Grade: Custom.

C. Finish: AWI System TR-4 conversion varnish or TR-6 catalyzed polyurethane.

D. Staining: As selected by Architect from manufacturer’s full range.

E. Sheen: As selected by Architect from manufacturer’s full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

B. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

C. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.2 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

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.

END OF SECTION 08 14 16

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Access doors and frames for ceilings.
B. Related Sections include the following:
   1. Division 23 Sections for heating and air-conditioning duct access doors.

1.3 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, 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. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.
D. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain access door(s) and frame(s) through one source from a single manufacturer.
B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
   1. ASTM A 123/A 123M, for galvanizing steel and iron products.
   2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
B. Steel Sheet: Uncoated cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
C. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
   2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.
D. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.2 ACCESS DOORS AND FRAMES FOR CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. J. L. Industries, Inc.
   2. Karp Associates, Inc.
   3. Larsen's Manufacturing Company.
   4. Milcor Inc.
   5. Nystrom, Inc.

B. Recessed Access Doors and Trimless Frames: Fabricated from steel sheet.
   1. Locations: Ceiling surfaces.
   2. Door: Minimum 0.060-inch- thick sheet metal in the form of a pan recessed 5/8 inch for gypsum board infill.
   3. Frame: Minimum 0.060-inch- thick sheet metal with drywall bead for gypsum board surfaces.
   4. Hinges: Concealed pivoting rod hinge.
   5. Latch: Cam latch operated by screwdriver with interior release.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
   1. For trimless frames with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
   2. Provide mounting holes in frames for attachment of units to metal or wood framing.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
   1. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 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 08 31 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Commercial manually operated sectional doors with glass vision panels.

1.3 RELATED SECTIONS

A. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.

1.4 SUBMITTALS

A. 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 methods.
   4. Included rated capacities, operating characteristics, manually operated characteristics, and furnished accessories

B. Shop Drawings:
   1. Provide drawings indicating track details, head and jamb conditions, spring shafts, anchorage, accessories, finish colors, patterns and textures, operator mounts and other related information.
   2. Include diagrams for power, signal, and control wiring.

C. Certifications:
   1. Submit manufacturer's certificate that products meet or exceed specified requirements.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity and trained and authorized by the door dealer to perform the work of this section.

B. Regulatory Requirements: Comply with applicable provisions in the US Architectural & Transportation Barriers Compliance Boards ADA-ABA Accessibility Guidelines and ICC A117.1.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in

accordance with requirements of local authorities having jurisdiction.

1.8 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.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 25 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Subject to compliance with requirements, provide Raynor Garage Doors, AlumaView AV300 with tinted, tempered glass as indicated on Drawings; Website: www.raynor.com or comparable products by one of the following:
1. Clopay Building Products.
2. Overhead Door Corporation.

B. Finish:
1. As selected by Architect from manufacturer’s full range of colors.

2.2 SECTIONAL DOORS

A. Sectional Doors:
1. Doors:
a. Operation:
1) Provide doors designed for electrical operation.
b. Jamb Construction:
1) Steel jambs with self-tapping fasteners.
c. Structural Performance Requirements:
1) Wind Loads: Uniform pressure as indicated on Drawings.
2. Sections: (Basis of Design)
a. AlumaView Optima:
1) Material: 2 inches thick, 6063-T6 aluminum alloy stiles and rails joined together with 5/16-inch diameter screws. Glazing panels 0.050-inch-thick fill the spaces between stiles and rails. Combined dimension of two adjoining intermediate meeting rails 3-13/16 inches. Bottom rail height 5-1/4 inches. Top rail height 3-1/4 inches or 5-1/4 inches as determined by overall door width. End stiles 3-3/8 inches or 6-1/2 inches wide as determined by overall door width. Center

stiles 3-5/8 inches wide.
2) Finish: Aluminum frame extrusions and filler panels; factory, high-performance finish coated.
a) Color: As selected by Architect from manufacturer's full range of colors.
b. Seals: Bottom of door to have flexible U-shaped vinyl seal retained in aluminum rail.
a) Bulb-type joint seal between sections
b) Blade seal on top section to prevent airflow above header
c. Trussing: Doors designed to withstand specified wind load. Deflection of door in horizontal position to be maximum of 1/120th of door width.
3. Windows: Provide door sections with windows (in lieu of 0.050-inch aluminum filler panels); locations to comply with door elevation drawings.
a. Glazing: Provide vision panels in frosted, opaque, tempered glass vision panels in thicknesses indicated on Drawings.
4. Mounting: Sections mounted in door opening as indicated on Drawings.
5. Track:
a. Material: Hot-dipped galvanized steel (ASTM A 653), fully adjustable for adequate sealing of door to jamb or weatherseal.
b. Configuration Type: As indicated.
c. Track Size:
1) Size: 3 inches.
d. Mounting: As indicated on Drawings.
1) Finish: Galvanized.
6. Counterbalance:
a. Counterbalance System: Provided with aircraft-type, galvanized steel lifting cables with minimum safety factor of 5. Torsion Springs consisting of heavy-duty oil-tempered wire torsion springs on a continuous ball-bearing cross-header shaft.
1) Spring Cycle Requirements: High Cycle 50,000 cycles.
7. Electric Door Operator:
a. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
b. Operator Type: As indicated on Drawings.
c. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower.
d. Emergency Manual Operation Type: As selected by Architect.
e. Obstruction-Detection Device: Automatic photoelectric sensor; self-monitoring type.
f. Control Station: Where indicated on Drawings.
g. Other Equipment: Audible and visual signals.
8.Hardware:
a. Hinges and Brackets: Fabricated from galvanized steel.
b. Track Rollers: Manufacturer's recommended diameter consistent with track size, with hardened steel ball bearings.
c. Perimeter Seal: Provide complete weather-stripping system to reduce air infiltration. Weather stripping shall be replaceable.
1) For bracket, mounted doors provide climate seal or vinyl seal with aluminum retainer.
2) For angle, mounted doors provide angle clip-on seal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared. Verify that site conditions

are acceptable for installation of doors, operators, controls and accessories. Ensure that openings are square, flush and plumb.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 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.

3.3 INSTALLATION

A. General: Install door, track and operating equipment complete with all necessary accessories and hardware according to approved shop drawings, manufacturer's instructions.

B. Lubricate bearings and sliding parts, and adjust doors for proper operation, balance, clearance and similar requirements.

3.4 PROTECTION

A. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove and legally dispose of construction debris from project site.

B. Remove temporary coverings and protection of adjacent work areas. Repair or replace installed products damaged prior to or during installation.

C. Protect installed products until completion of project.

D. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 08 36 15

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior aluminum-framed storefronts.
      a. Glazing is retained mechanically with gaskets on four sides.
   2. Exterior manual-swing aluminum doors.
   3. Exterior aluminum doorframes.

B. Related Sections include the following:
   1. Division 07 Section "Joint Sealants" for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
   2. Division 08 Section "Door Hardware" for hardware to the extent not specified in this Section.
   3. Division 08 Section "Glazing" for glazing requirements to the extent not specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:
   1. Structural loads.
   2. Thermal movements.
   3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
   4. Dimensional tolerances of building frame and other adjacent construction.
   5. Failure includes the following:
      a. Deflection exceeding specified limits.
      b. Thermal stresses transferred to building structure.
      c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
      d. Noise or vibration created by wind and thermal and structural movements.
      e. Loosening or weakening of fasteners, attachments, and other components.
      f. Sealant failure.
      g. Failure of operating units to function properly.

B. Structural Loads:
   1. Wind Loads: As indicated on Drawings.
   2. Seismic Loads: As indicated on Drawings.

C. Deflection of Framing Members:
   1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches 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 1/360 of clear span or 1/8 inch, whichever is smaller.

D. 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 less than 10 seconds.

E. 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.

F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.01 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.

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 not less than 15 lbf/sq. ft.

H. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 60 when tested according to AAMA 1503.

I. Average Thermal Transmittance: Provide aluminum-framed systems with fixed glazing and framing areas having average U-value of not more than 0.46 Btu/hr/sq. ft./deg F.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
1. Include structural analysis data signed and sealed by the qualified professional engineer, licensed in the State of North Carolina, responsible for their preparation.
2. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
3. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of systems, made from 12-inch lengths of full-size components and showing details of the following:
1. Joinery.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Qualification Data: For Installer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.

H. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

I. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.

1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.

B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

C. Source Limitations: Obtain aluminum-framed entrance and storefront system components from a single manufacturer.

D. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

1.6 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.

1.7 WARRANTY

A. Special Assembly 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 deteriorate as defined in this Section within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration caused by thermal movements.
   c. Deterioration of metals and other materials beyond normal weathering.
   d. Adhesive or cohesive sealant failures.
   e. Water leakage through fixed glazing and framing areas.
   f. Failure of operating components to function properly.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Basis-of-Design Product: Subject to compliance with requirements, provide aluminum-framed entrances and storefronts BY YKK AP America, Inc. as indicated on Drawings or comparable products by one of the following:
2. Kawneer North America.
3. Oldcastle Building Envelope.

2.2 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.

B. Steel Reinforcement: With manufacturer's standard 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.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Framing members are composite assemblies of two separate extruded-aluminum components permanently bonded by an elastomeric material of low thermal conductance.

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. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. 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 requirements.

E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

2.5 DOORS

A. Doors: Manufacturer's standard glazed doors, for manual swing operation.
1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.
2. Door Design: As indicated on Drawings.
a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
a. Provide nonremovable glazing stops on outside of door.

B. Door Hardware: As specified in Division 08 Section "Door Hardware."

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.7 FABRICATION

A. Form aluminum shapes before finishing.

B. 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 fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within 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 from exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

C. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).

D. Storefront Framing: Fabricate components for assembly using shear-block system.

E. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 percent PVDF resin by weight in color coat.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

3.2 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 by applying sealant or tape or 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 07 Section "Joint Sealants" and to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrances: Install to produce smooth operation and tight fit at contact points.
   1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
   2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" and to produce weathertight installation.

I. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum 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.
   3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 ADJUSTING

A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.
   1. For 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.

END OF SECTION 08 41 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Hardware for doors as specified in Division 08 – Openings.
   2. Lock cylinders for doors for which hardware is specified in other Sections.
   3. Key controls.
   4. Thresholds.
   5. Weatherstripping, seals and door gaskets.

1.3 SUBMITTALS

A. Hardware Schedule: The hardware supplier shall submit along with the Finish Hardware Schedule, catalogue cuts of all items submitted as well as catalogue cuts of the specified items. If ANSI products or generic items are specified, the scheduled items will be cross referenced. Provide samples when requested.

B. Samples: Prior to preparation of hardware schedule:
   1. Submit 1 sample of hinge, latchset, lockset, closer, and other scheduled hardware illustrating style, color, and finish.
   2. Samples will be returned to supplier.

1.4 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Perform work in accordance with the following requirements:
   1. NFPA 101.
   2. NFPA 80.
   3. NFPA 252.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.6 COORDINATION

A. Coordinate the work with other directly affected Sections involving manufacture or fabrication of internal reinforcement for door hardware.

B. Furnish templates for door and frame preparation.

C. Coordinate Owner's keying requirements during the course of the Work.

1.7 WARRANTY

A. Special 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: Five years from date of Substantial Completion.

1.8 MAINTENANCE PRODUCTS

A. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hardware Manufacturers: As indicated in Door Hardware Schedule.

B. Hardware Products:

1. Hinges.
2. Locks, Latches and Bolts.
3. Push/Pulls.
4. Exit Devices.
5. Closers.
6. Stops, Strikes, and Holders.
7. Thresholds.
8. Weatherstripping.

2.2 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with the following:

1. Applicable provisions of Federal, State, and local Codes.

B. Finishes: All hardware shall be polished brass unless otherwise indicated.

2.3 KEYING

A. All locks shall be construction mastered keyed. Provide two (2) change of keys for all locks. Obtain owner's keying requirements and approval of final keying. Tag all keys above change keys and forward by registered mail direct from manufacturer to Owner.

2.4 KEY CONTROLS

A. Fire Department Lock Box: Heavy-duty, surface mounted, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers and tamper alarm.

B. Manufacturer and Product: Subject to compliance with requirements, provide the following:

1. Knox Company; Knox-Box 3200 Series Hinged Door Model; Website: www.knoxbox.com.

C. Capacity: Holds 10 keys.

D. Finish: Manufacturer's standard Dark Bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that doors and frames are ready to receive work and dimensions are as indicated on approved Shop Drawings.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Install hardware on fire-rated doors and frames in accordance with Building Code and NFPA 80.

D. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted:

1. For steel doors: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."
2. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. For key controls: Locate as directed by authorities having jurisdiction. Install in accordance with manufacturer’s written installation instructions.

3.3 ADJUSTING

A. Adjust work under provisions of Division 01 Section "Execution".

B. Adjust hardware for smooth operation.

3.4 PROTECTION

A. Protect finished Work under provisions of Division 01 Section "Execution".

B. Do not permit adjacent work to damage hardware or finish.

3.5 FINAL

A. At completion of the project, the hardware supplier shall review the keying systems, adjustment and maintenance procedures with the Owner. The hardware supplier is to inspect the project after installation and adjust builder's hardware for proper operation and function of each door. Lubricate and clean each item. Instruct Owner's personnel in proper maintenance and adjustment of work and furnish him a complete set of adjustment tools.

3.6 SCHEDULED DOOR HARDWARE

1. MK - McKinney
2. MR - Markar
3. YA - Yale
4. RO - Rockwood
5. RF - Rixson
6. NO - Norton
7. PE - Pemko

Hardware Sets

Set: 1.0 (DOOR 108, 118, 120, 121, 122)

	Hinge	T4A3386 x NRP	US32D	MK
1	Exit Device	7100 PB627F	630	YA
1	Cylinder	AS REQUIRED	630	YA
1	Surface Closer	CPS7500	689	NO
1	Kick Plate	K1050 8" HIGH CSK	US32D	RO
1	Threshold	2005AT		PE
1	Set Weatherstrip	303AS		PE
1	Sweep	3452CNB		PE

Set: 2.0 (DOOR 107)

	Hinge	TA2714	US26D	MK
1	Exit Device	7100 PB626F	630	YA
1	Cylinder	AS REQUIRED	630	YA
1	Door Closer	PR8501	689	NO
1	Kick Plate	K1050 8" HIGH CSK	US32D	RO
1	Door Stop	409/441CU	US26D	RO
1	Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 3.0 (DOOR 115)

	Hinge	TA2714	US26D	MK
1	Exit Device	7100F PB626F	630	YA
1	Cylinder	AS REQUIRED	630	YA
1	Door Closer	PR8501	689	NO
1	Kick Plate	K1050 8" HIGH CSK	US32D	RO
1	Door Stop	409/441CU	US26D	RO
1	Set Door Seals	S88D		PE

Set: 4.0 (DOOR 110, 111)

	Hinge	TA2714	US26D	MK
1	Push Plate	70C	US32D	RO
1	Pull Plate	111 x 70C	US32D	RO
1	Door Closer	8501	689	NO
1	Kick Plate	K1050 8" HIGH CSK	US32D	RO
1	Door Stop	409/441CU	US26D	RO
1	Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 5.0 (DOOR 109)

	Hinge	TA2714	US26D	MK
1	Passage Latch	PB 5401LN	626	YA
1	Door Stop	409/441CU	US26D	RO
1	Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 6.0 (DOOR 116)

	Hinge	TA2714	US26D	MK
1	Passage Latch	PB 5401LN	626	YA
1	Door Closer	PR8501	689	NO
1	Kick Plate	K1050 8" HIGH CSK	US32D	RO
1	Door Stop	409/441CU	US26D	RO
1	Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 7.0 (DOOR 113 ALT: 112, 114)

	Hinge	TA2714	US26D	MK
1	Passage Latch	PB 5401LN	626	YA
1	Door Closer	8501	689	NO
1	Kick Plate	K1050 8" HIGH CSK	US32D	RO
1	Door Stop	409/441CU	US26D	RO
1	Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE
1	Hardware	SEE NOTE BELOW		00

NOTE: PROVIDE OVERHEAD STOP IN LIEU OF WALL STOP WHERE APPLICABLE.

Set: 8.0 (DOOR ALT: 105)

	Hinge	TA2714	US26D	MK
1	Office Lock	PB 5407LN	626	YA
1	Door Stop	409/441CU	US26D	RO
1	Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 9.0 (DOOR 103B, 106)

	Hinge	TA2714	US26D	MK
1	Classroom Lock	PB 5408LN	626	YA
1	Door Closer	8501	689	NO
1	Kick Plate	K1050 8" HIGH CSK	US32D	RO
1	Door Stop	409/441CU	US26D	RO
1	Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 10.0 (DOOR 104)

	Hinge	TA2714	US26D	MK
1	Classroom Lock	PB 5408LN	626	YA
1	Overhead Stop	10-X36	630	RF
1	Door Closer	8501	689	NO
1	Kick Plate	K1050 8" HIGH CSK	US32D	RO
1	Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 11.0 (DOOR ALT: 122)

	Hinge	TA2314	US32D	MK
1	Passage Latch	PB 5401LN	626	YA
1	Door Closer	CPS8501	689	NO
1	Kick Plate	K1050 8" HIGH CSK	US32D	RO
1	Threshold	171A		PE
1	Set Weatherstrip	303AS		PE
1	Door Bottom	222APK		PE

Set: 12.0 (DOOR 100, 103)

	Hinge	TA2314	US32D	MK
1	Classroom Lock	PB 5408LN	626	YA
1	Door Closer	8501	689	NO
1	Kick Plate	K1050 8" HIGH CSK	US32D	RO
1	Door Stop	409/441CU	US26D	RO
1	Threshold	171A		PE
1	Set Weatherstrip	303AS		PE
1	Door Bottom	222APK		PE
1	Hardware	SEE NOTE BELOW		00

Set: 13.0 (DOOR 101 ALT: 102)

	Hinge	TA2314	US32D	MK
1	Storeroom Lock	PB 5405LN	626	YA
1	Door Closer	8501	689	NO
1	Kick Plate	K1050 8" HIGH CSK	US32D	RO
1	Door Stop	409/441CU	US26D	RO
1	Threshold	171A		PE
1	Set Weatherstrip	303AS		PE
1	Door Bottom	222APK		PE

Set: 14.0 (OOR 001, 002, 003, 004, 005, 006 , ALT: 007, 008, 009, 010)

1	Cylinder	AS REQUIRED	630	YA
1	Hardware	SEE NOTE BELOW		00

NOTE: OVERHEAD DOOR - BALANCE OF HARDWARE TO BE SUPPLIED BY DOOR MANUFACTURER.

END OF SECTION 08 71 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows.
   2. Glazed entrances.
   3. Applied translucent film.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: 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 an 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 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.

1.4 PERFORMANCE 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. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
   1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
      a. Specified Design Wind Loads: As indicated.
      b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
         1) Load Duration: 60 seconds or less.
      c. Maximum Lateral Deflection: For the following types of glass supported on all 4 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.
         1) For monolithic-glass lites heat treated to resist wind loads.
         2) For insulating glass.
      d. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. 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.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
   1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
   2. For insulating-glass units, properties are based on units with lites 6.0 mm thick and a nominal 1/2-inch- wide interspace.
   3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
      a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
      b. Solar Heat Gain Coefficient: NFRC 200.
      c. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- square Samples for glass.
   1. Coated vision glass.
   2. Insulating glass for each designation indicated.

C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
   1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

E. Qualification Data: For installers.

F. Product Test Reports: For each of the following types of glazing products:
   1. Coated float glass.
   2. Insulating glass.

G. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. 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's Certified Glass Installer Program.

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, frosted float glass, coated float glass, and insulating glass.

C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

E. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.

1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

F. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
   1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
   2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
   1. Insulating Glass Certification Council.

1.7 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.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other articles including schedules where subparagraph titles below introduce lists, the following requirements apply for product selection:
   1. Product: Subject to compliance with requirements, provide the product specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 GLASS PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one following:
   a. AFGD Glass, a subsidiary of AFG Industries, Inc.
   b. Guardian Industries Corp.
   c. PPG Industries, Inc.
   d. Viracon, Inc.

B. Uncoated Clear Float Glass: Where glass as designated below is indicated, provide Type I (transparent glass, flat), Class 1 (clear) glass lites complying with the following:
   1. Uncoated Clear Fully Tempered Float Glass: Kind FT (fully tempered).

C. Coated Glass, General: Provide coated glass complying with requirements indicated in this Article and in schedules at the end of Part 3.
   1. Provide Kind HS (heat-strengthened) coated float glass in place of coated annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.

D. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.
   1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.
   2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
   3. Sealing System: Dual seal with polyisobutylene and silicone primary and secondary sealants.
   4. Spacer: Manufacturer's standard.
   5. Corner Construction: Manufacturer's standard.
   6. Overall Unit Thickness and Thickness of Each Lite: 25 and 6 mm.
   7. Interspace Content: Air.

2.3 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.4 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

A. Applied Translucent Film:
   1. Manufacturers: Subject to compliance with requirements, provide the following:
      a. 3M Window Films:
         1) Blackout.
         2) Ultra Series.
            a) Color: As selected by Architect.
      b. Finish: Matte, unless otherwise selected by Architect.

2.5 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze 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.
B. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep system.
   3. Minimum required face or edge clearances.
   4. Effective sealing between joints of glass-framing members.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

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 referenced glazing publications.
B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
E. 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.
F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
   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.

H. 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.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Apply translucent film to glazing in accordance with film manufacturers written instructions.

3.4 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 and then to jambs. Cover horizontal framing joints by applying tapes to jambs and 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 just before each glazing unit is installed.

F. 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.

3.5 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. 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; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.6 MONOLITHIC FLOAT-GLASS UNITS

A. Uncoated Clear Float Glass: Where glass as designated below is indicated, provide Type I (transparent glass, flat), Class 1 (clear) glass lites complying with the following:

1. Uncoated Clear Fully Tempered Float Glass, **Type G-1**: Kind FT (fully tempered).
2. Thickness: ¼".

3.7 INSULATING-GLASS UNITS - TEMPERED

A. Low-E Insulating Tempered Glass Clear, **Type G-2**: Where glass of this designation is indicated, provide 1" thickness low-emissivity insulating-glass units.

3.8 INSULATING-GLASS UNITS – LOW E

A. Low-E Insulating Glass Clear, **Type G-3**: Where glass of this designation is indicated, provide 1" thickness low-emissivity insulating-glass units.

3.9 GLASS UNITS, TEMPERED

A. Glass Clear, Tempered, **Type G-7**: Where glass of this designation is indicated, provide ½" thickness clear tempered glass.

3.10 INSULATING-GLASS UNITS, LOW E TEMPERED

A. Low-E Insulating Glass Clear, **Type G-8**: Where glass of this designation is indicated, provide ½" low-emissivity tempered insulating-glass units.

3.11 FIRE-RESISTANT RATED GLASS UNITS

A. Fire-resistant 45-minute rated, **Type G-9**: Where glass of this designation is indicated, provide fire-resistant rated glass units.

END OF SECTION 08 80 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Annealed monolithic glass mirrors.

1.3 SUBMITTALS

A. Product Data: For mirror hardware and mastic.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

C. Samples: For each type of mirror product required, in the form indicated below:
   1. Mirrors, 12 inches square, including edge treatment on 2 adjoining edges.
   2. Mirror clips.
   3. Mirror trim, 12 inches long.

D. Product Certificates: For each type of mirror and mirror mastic, signed by product manufacturer.

E. Mirror Mastic Compatibility Test Reports: From mirror manufacturer.

1.4 QUALITY ASSURANCE

A. Glazing Publications: Comply with GANA's "Glazing Manual" and GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors" unless more stringent requirements are indicated

B. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing and substrates on which mirrors are installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form made out to Owner and signed by mirror manufacturer agreeing to replace mirrors that deteriorate, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated in second subparagraph below.
   1. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRROR MATERIALS

A. Clear Glass Mirrors: ASTM C 1503, Mirror Select Quality.
   1. Nominal Thickness: 5.0 mm, unless otherwise indicated.

B. Manufacturers: Subject to compliance with requirements, provide mirrors by one of the following:
   1. Gardner Glass Products.
   2. Guardian Industries Corp.
   3. Lenoir Mirror Company.
   4. Stroupe Mirror Co., Inc.
   5. Virginia Mirror Company, Inc.

2.2 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Type A Shore durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Gunther Mirror Mastics.
      b. Macco Adhesives; Liquid Nails Division.
      c. Palmer Products Corporation.
      d. Pecora Corporation.

2.3 MIRROR HARDWARE

A. Mirror Bottom Clips: As indicated.

B. Mirror Top Clips: As indicated.

C. Plated Steel Hardware: Formed-steel shapes with plated finish.
   1. Profile: As indicated.

D. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.4 FABRICATION

A. Mirror Sizes: To suit Project conditions, cut mirrors to final sizes and shapes.

B. Mirror Frame: Frame as indicated on Drawings.

C. Mirror Edge Treatment: Beveled polished edge of width shown.
   1. Seal edges of mirrors after edge treatment to prevent chemical or atmospheric penetration of glass coating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

B. Provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. For wall-mounted mirrors, install with mastic and mirror hardware.
   1. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
   2. For metal clips, place a felt or plastic pad between mirror and each clip to prevent spalling of mirror edges.
   3. Install mastic as follows:
      a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
      b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
      c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch between back of mirrors and mounting surface.
D. Protect mirrors from breakage and contaminating substances resulting from construction operations.
E. Do not permit edges of mirrors to be exposed to standing water.
F. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION 08 83 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Fixed, extruded-aluminum louvers.
B. Related Sections include the following:
   1. Division 07 Section "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
B. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide louvers capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act on vertical projection of louvers.
   1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
B. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. 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.
C. Air-Performance, Water-Penetration, Air-Leakage, and Wind-Driven Rain Ratings: Provide louvers complying with performance requirements indicated, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.
C. Samples for Initial Selection: For units with factory-applied color finishes.
D. Samples for Verification: For each type of metal finish required.
E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Airolite Company (The).
2. American Warming and Ventilating, Inc.
3. Ruskin Company.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Channel, unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches o.c., whichever is less.

1. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

F. Where indicated, provide subsills made of same material as louvers for recessed louvers.

G. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer, concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.4 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Drainable-Blade Louver:
   1. Louver Depth: As indicated.
   2. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.125 inch.
   3. Mullion Type: Exposed.
   4. Performance Requirements:
      a. Free Area: Not less than 8.0 sq. ft. for 48-inch- wide by 48-inch- high louver.
      b. Point of Beginning Water Penetration: Not less than 1000 fpm.
      c. Air Performance: Not more than 0.15-inch wg static pressure drop at 1000-fpm free-area velocity.
   5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.5 LOUVER SCREENS

A. General: Provide screen at each exterior louver.
   1. Screen Location for Fixed Louvers: Interior face.
   2. Screening Type: Bird screening.

B. Secure screens to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
   1. Metal: Same kind and form of metal as indicated for louver to which screens are attached.
   2. Finish: Mill finish, unless otherwise indicated.

D. Louver Screening:
   1. Bird Screening: Flattened, expanded aluminum, 3/4 by 0.050 inch thick.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish louvers after assembly.

2.7 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.

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 manufacturers' written instructions.
   1. Fluoropolymer Two-Coat Coating System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
      a. Color and Gloss: As selected by Architect from manufacturer's full range of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

END OF SECTION 08 90 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Interior gypsum wallboard.
   2. Bullet-resistant gypsum board assemblies.
   3. Non-load-bearing steel framing.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.
   1. STC-Rated Assemblies: Indicate ratings and details of construction for all STC-rated assemblies.
   2. Bullet–Resistant Assemblies: Indicate thickness and resistance level of bullet resistant fiberglass panels and details of construction
   3. For metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance-Rated Assemblies: Indicated by design designations from UL's "Fire Resistance Directory" or other referenced organization and publication.

B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
   1. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. 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.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

PART 2 - PRODUCTS

2.1 STEEL SUSPENDED CEILING FRAMING

A. Components, General: Comply with ASTM C 754 for conditions indicated.

B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

C. Hangers: As follows:
   1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
   2. Rod Hangers: ASTM A 510, mild carbon steel, ASTM A 153/A 153M, mill galvanized.
   3. Flat Hangers: Commercial-steel sheet, ASTM A 653/A 653M, mill galvanized; size as indicated.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch- wide flange, with ASTM A 653/A 653M, G40, mill galvanized; depth as indicated.

E. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G40, mill galvanized.
   1. Cold Rolled Channels: 0.0538-inch bare steel thickness, with minimum 1/2-inch-wide flange, 3/4 inch deep.
   2. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8-inch-deep; minimum 0.0179-inch base metal thickness.

F. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Products: Subject to compliance with requirements, provide one of the following or approved equal:
      a. Armstrong World Industries, Inc.; Furring Systems/Drywall.
      b. Chicago Metallic Corporation; Drywall Furring 640 or Fire Front System.
      c. USG Interiors, Inc.; Drywall Suspension System.

2.2 STEEL PARTITION FRAMING

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 ASTM A 653/A 653M, G40, mill galvanized.

B. Steel Studs and Runners: ASTM C 645.
   1. Minimum Base Metal Thickness: Minimum 0.0179 inch, or greater as recommended by manufacturer based on limiting heights, spans and applied loads.
   2. Depth: As indicated.

C. Deep-Leg Deflection Track: ASTM C 645 top runner with 2-inch- deep flanges.

D. Proprietary Deflection Track: Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs.
   1. Product: Subject to compliance with requirements, provide products from the following manufacturers:
      a. Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).
      b. Metal-Lite, Inc.; Slotted Track.
      c. The Steel Network; VertiClip.

E. Proprietary Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

   1. Product: Subject to compliance with requirements, provide one of the following or comparable product approved by Architect:
      a. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
      b. Metal-Lite, Inc.; The System.

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base Metal Thickness: Minimum 0.0179 inch.
G. Cold-Rolled Channel Bridging: 0.0538-inch bare steel thickness, with minimum 1/2-inch- wide flange.
   1. Depth: As indicated.
   2. Clip Angle: 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base Metal Thickness: Minimum 0.0179 inch.
   2. Depth: As indicated.
I. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission; asymmetrical, with face attached to single flange by a slotted leg.
J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare metal thickness of 0.0179 inch, and depth as indicated.
K. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.3 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
B. Gypsum Wallboard: ASTM C 1936.
   1. Regular Type:
      a. Thickness: 5/8-inch, unless otherwise indicated.
      b. Long Edges: Tapered.
   2. Type X:
      a. Thickness: 5/8-inch, less otherwise indicated.
      b. Long Edges: Tapered.
C. Cementitious Backer Units: ANSI A118.9, as specified in Division 09 Section "Tiling".
D. Abuse-Resistant Gypsum Board: ASTM C 1629, Level 3
   1. Core: 5/8 inch (15.9 mm), Type X.
   2. Long Edges: Tapered.
   3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 BULLET RESISTANT GYPSUM WALL ASSEMBLIES

A. Provide bullet resistant gypsum board wall assemblies consisting of two gypsum board panels with bullet-resistant fiberglass panel sandwiched in between, as detailed on Drawings at locations indicated and in compliance with UL752.
   1. Bullet-Resistant Fiberglass Panels, Combining Woven-Roving Fiberglass with Resin: Subject to compliance with requirements, provide ArmorCore by Waco Composites, Ltd.; Website: www.armorcore.com.
      a. Thickness and Bullet Resistance Rating: 1-1/8 inches minimum thickness to achieve a Level 7 bullet resistance rating.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet, or rolled zinc.
   2. Shapes:
      a. Cornerbead: Use at outside corners, unless otherwise indicated.
      b. LC-Bead: Use at exposed panel edges.
      c. Expansion (Control) Joint: Use where indicated.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape: Paper.

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, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting -type, all-purpose compound.
3. Fill Coat: For second coat, use setting-type, all-purpose compound.
4. Finish Coat: For third coat, use setting -type, all-purpose compound.

2.7 ACOUSTICAL SEALANT

A. Products: As specified in Division 07 Section "Joint Sealants".

2.8 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.

C. 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.
3. For attachment of single layer of gypsum board to resilient furring, use ¾-inch long, Type W bugle head.

D. Isolation Strip at Exterior Walls:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8-inch-thick, in width to suit steel stud size.

E. Sound Attenuation Blankets: As specified in Division 07 Section "Thermal Insulation".

F. Sound Attenuation Fire Blankets (SAFB): ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers, with a density of 2.5 pounds per cubic foot.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.

1. Furnish concrete inserts and other devises indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.

1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.
    a. Use deep-leg deflection or proprietary deflection track where indicated.
    b. Use proprietary firestop track where indicated in rated assemblies.

D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

3.4 INSTALLING STEEL SUSPENDED CEILING FRAMING

A. Suspend ceiling hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Secure hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel deck tabs.
6. Do not attach hangers to steel roof deck. Attach hangers to structural members.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet measured lengthwise on each member and transversely between parallel members.

C. Sway-brace suspended steel framing with hangers used for support.

D. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

E. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL PARTITION FRAMING

A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.
   1. Where studs are installed directly against exterior walls, install asphalt-felt or foam-gasket isolation strip between studs and wall.

B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
   1. Cut studs 1/2 inch short of full height to provide perimeter relief.
   2. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.
      a. Terminate partition framing at suspended ceilings where indicated.

D. Install steel studs and furring at the following spacings:
   1. Single-Layer Construction: 16 inches o.c., unless otherwise indicated.
   2. Multilayer Construction: 16 inches o.c., unless otherwise indicated.
   3. Cementitious Backer Units: 16 inches o.c., unless otherwise indicated.

E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

F. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   1. Install two studs at each jamb, unless otherwise indicated.
   2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint.
   3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

G. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

3.6 APPLYING AND FINISHING PANELS, GENERAL

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges

against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Form control and expansion joints with space between edges of adjoining gypsum panels.

I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.

J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

K. STC-Rated Assemblies: Seal construction at perimeters, behind control and expansion 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 manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
   1. When attaching gypsum board to resilient channels, space screws at least 6 inches from steel studs.

L. Bullet-Resistant Assemblies: Install in accordance with bullet resistant panel manufacturer’s written installation instructions and as indicated on Drawings. In addition, install bullet resistant four-inch-wide batten strips at all panel joints and bullet resistant backer at all wall penetrations.

M. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
   1. Space screws a maximum of 12 inches o.c. for vertical applications.

N. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

3.7 PANEL APPLICATION METHODS

A. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of board.
      b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

B. Multilayer Application on Ceilings: Apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

C. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

D. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
E. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.
F. Abuse-Resistant Type: As indicated on Drawings.
G. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.8 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
    1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated.
    2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated.
    3. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
    4. Level 5: Where indicated on Drawings.
        a. Primer and its application to surfaces are specified in other Division 09 Sections.

END OF SECTION 09 29 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Floor and wall tile.
   2. Stone thresholds installed as part of tile installations.
   3. Waterproof and crack-suppression membrane for thin-set tile installations.
   4. Cementitious backer units installed as part of tile installations.
   5. Metal edge strips installed as part of tile installations.

1.3 SUBMITTALS

A. Product Data: For each 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.

C. Samples for Initial Selection:
   1. Each type, composition, color, and finish of tile specified for initial selection by Architect.
   2. Assembled samples with grouted joints for each type, composition, color, and finish of tile.
   3. Stone thresholds in 6-inch lengths.

1.4 EXTRA MATERIALS

1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   a. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.
   b. Wall Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of wall tile installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
   2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
   3. 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 a comparable product by one of the other manufacturers specified.

2.2 TILE PRODUCTS

A. Basis of Design Manufacturers and Products: Subject to compliance with requirements, provide floor and wall tile products by Trinity Surfaces and Daltile; Div. of Dal-Tile International, Inc. as indicated on Finish Schedule or comparable products by one of the following, as approved by Architect / Interior Designer:
   1. American Olean; Div. of Dal-Tile International Corp.
   2. Crossville Ceramics Company, L.P.
   3. Florida Tile Industries, Inc.

4. Laufen USA.

B. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

C. TCNA Environmental Classification: Provide tile and installation in accordance with TCNA CF-113-11-1.

D. Wall and Floor / Paver Tile: Vitreous or impervious porcelain flat tile.

E. Tile trim units that match characteristics of adjoining flat tile.

F. Where indicated, protect exposed surfaces of tile against adherence of mortar and grout by factory precoating them with a hot-applied continuous film of petroleum paraffin wax. Do not coat unexposed tile surfaces.

2.3 ACCESSORY MATERIALS

A. Stone Thresholds: White, honed marble thresholds complying with the Marble Institute of America's Group A requirements for soundness, and with ASTM C 503 fabricated to be not more than ½-inch above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.

B. Waterproofing and Crack-Suppression Membranes for Thin-Set Tile Installations: Manufacturer's standard product that complies with ANSI A118.10, selected from the following.

1. Fabric-Reinforced, Fluid-Applied Product: Liquid-latex rubber, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), with fabric reinforcement.
   a. Available Products:
      1) Custom Building Products; 9240 Waterproof Membrane.
      2) LATICRETE International Inc.; Laticrete 9235 Waterproof Membrane.
      3) MAPEI Corporation; PRP M19.
2. Unreinforced, Fluid-Applied Product: Liquid-latex rubber, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   a. Available Products:
      1) Boiardi Products Corporation; Elastiment 324.
      2) Custom Building Products; Red Gard Waterproofing and Anti-Fracture Membrane.
      3) Jamo Inc.; Waterproof.
3. Latex-Portland Cement Product: Flexible mortar with acrylic-latex additive.
   a. Available Products:
      1) Boiardi Products Corporation; Elastiment 323.
      2) MAPEI Corporation; PRP 315.
      3) Southern Grouts & Mortars, Inc.; Southcrete 1100.
      4) TEC Specialty Products Inc.; TA-324, Triple Flex.

2.4 SETTING AND GROUTING MATERIALS

A. Available Manufacturers:

1. Bonsal, W. R., Company.
2. Custom Building Products.
3. LATICRETE International Inc.
4. MAPEI Corporation. (Basis of Design)
5. TEC Specialty Products Inc.

B. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.1A.

C. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.

D. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

** Latex-Portland Cement Mortar (LHT Mortar-Tiles over 15"): ANSI 118.4 and/or ANSI 118.15.

1. Prepackaged dry-mortar mix containing dry additive to which only water must be added.
2. Prepackaged dry-mortar mix combined with liquid-latex additive.

E. Organic Adhesive: ANSI A136.1, Type I, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
F. Standard Sanded Cement Grout: ANSI A118.6, color as indicated.
G. Standard Unsanded Cement Grout: ANSI A118.6, color as indicated.
H. High Performance Cement Grout: ANSI A118.7, color as indicated.
   1. Polymer Type: Dry, redispersible form, prepackaged with other dry ingredients.
   2. Polymer Type: Liquid-latex form for addition to prepackaged dry-grout mix.
I. Chemical Resistant, water cleanable 100% Epoxy Grouts: ANSI 118.3.
J. Optional Single Component Grout; Basis of Design: Custom Building Products; Fusion Pro Grout.
K. Grout for Pregrouted Tile Sheets: Same silicone rubber used in factory to pregrout tile sheets.

2.5 MISCELLANEOUS MATERIALS

A. Elastomeric Sealants: Elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 07 Section "Joint Sealants."
B. Cementitious Backer Units: ANSI A118.9 in maximum lengths available to minimize end-to-end butt joints.
   1. Thickness: Manufacturer's standard thickness, but not less than ¼-inch.
   2. Available Products:
      a. C-Cure; C-Cure Board 990.
      b. Custom Building Products; Wonderboard.
      c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
      d. USG Corporation; DUROCK Cement Board.
   3. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
C. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials.
D. Metal Edge Strips: Angle or L-shape, stainless steel; ASTM A 666, 300 Series exposed-edge material.
E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 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. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.
C. Remove protrusions, bumps, and ridges by sanding or grinding.
D. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.
E. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.2 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.

B. TCNA Installation Guidelines: Latest version of TCNA's "Handbook for Ceramic Tile Installation." Comply with TCNA installation methods indicated in ceramic tile installation schedules and with tile manufacturers' written installation instructions.

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. Grind cut edges of tile abutting trim, finish, or built-in items. 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, and trim are same size. Lay out tile work and center tile fields in both directions in each area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Grout tile to comply with requirements of ANSI A108.10, unless otherwise indicated.

1. For chemical-resistant epoxy grouts, comply with ANSI A108.6.

I. Backing Panels:

1. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
2. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.
3. At showers, tubs, and where indicated, install cementitious backer units and treat joints to comply with ANSI A108.11.

J. Install waterproofing and crack-suppression membranes to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

1. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.3 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.

B. Install tile on floors with joint widths as indicated or recommended by manufacturer.

C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

D. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

E. Apply grout sealer to grout joints in tile floors 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.

3.4 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. Install tile on walls with joint widths as indicated or recommended by manufacturer.

3.5 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 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.
   3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile 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.

3.6 WALL AND FLOOR TILE INSTALLATION SCHEDULE

A. Provide interior wall and floor tiles as indicated on Drawings and Finish Schedule.

END OF SECTION 09 30 00

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes acoustical panels and exposed suspension systems for ceilings.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Samples for Verification: Submit samples of acoustical ceiling panel products scheduled on Finish Schedule and samples of suspension system for selection by Architect.

C. Coordination Drawings: Drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Samples: For each acoustical panel, for each exposed suspension system member, for each exposed molding and trim, and for each color and texture required.

E. Product test reports.

F. Research/evaluation reports.

G. Maintenance data.

1.3 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory.

B. Fire-Test-Response Characteristics:

1. Fire-Resistance Ratings: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Ratings are indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
   a. Identify materials with appropriate markings of applicable testing and inspecting agency.
2. Surface-Burning Characteristics: Acoustical panels complying with ASTM E 1264 for Class A materials, when tested per ASTM E 84.
   a. Smoke-Developed Index: 450 or less.

C. Seismic Standard: Comply with the following:

1. ASTM E 580.
2. CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."

D. 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.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.6 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.7 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. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of quantity installed.
   2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
   3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANEL CEILINGS, GENERAL

A. Acoustical Panel Standard: Comply with ASTM E 1264.
B. Metal Suspension System Standard: Comply with ASTM C 635.
C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   1. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.
E. Seismic struts and seismic clips.
F. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

2.2 ACOUSTICAL CEILING PANELS

A. Basis-of-Design Product: Subject to compliance with requirements, provide acoustical ceiling tiles and panels by Armstrong World Industries, Inc. / Armstrong Ceiling & Wall Solutions as indicated on Interior Design Drawings or a comparable product by one of the following:
   1. Chicago Metallic Corporation.
   2. CertainTeed, Inc.
   3. USG Interiors, Inc.
B. Color: As indicated on Interior Design Drawings.
C. Edge Detail: As indicated on Interior Design Drawings.

D. Thickness: ¾-inch.
E. Size: 24 by 24-inches square and 24 by 48-inches panel.

2.3 METAL SUSPENSION SYSTEM

A. Products: Provide products by one of the following manufacturers:
   1. Armstrong World Industries, Inc.
   2. CertainTeed, Inc.
   3. Chicago Metallic Corporation.
   4. USG Corporation.
B. Style and Color: As selected by Architect.
C. Size: 15/16 with ACT-1, 9/16 with ACT-2, and 9/16 with ACT-3.
D. Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation, with prefinished 15/16-inch- wide metal caps on flanges.
   1. Structural Classification: Heavy-duty system.
   2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
   3. Cap Material: Steel or aluminum cold-rolled sheet.
   4. Cap Finish: Painted white.

2.4 METAL PERIMETER TRIM SYSTEM

A. Basis of Design Product: Subject to compliance with requirements, provide extruded aluminum AXIOM Building Perimeter System as indicated on Interior Design Drawings by Armstrong Ceiling Solutions; Website: www.armstrongceilings.com/shadepockets.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders.
C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with location of hangers, use trapezes or equivalent devices.
   1. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.
   2. Do not attach hangers to steel deck tabs or to steel roof deck.
D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate with concealed fasteners at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.66 m). Miter corners accurately and connect securely.
E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

END OF SECTION 09 51 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:
   1. Resilient stair treads and installation materials.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each exposed product and for each color and texture specified, not less than 12 inches long.

C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER STAIR TREADS

A. Basis of Design Manufacturer: Subject to compliance with requirements, provide products by Nora Rubber products as indicated on Finish Schedule or comparable products by one of the following, as approved by Architect / Interior Designer:
   1. Armstrong World Industries, Inc.
   2. Burke Flooring.
   3. Johnsonite.
   4. Roppe Corporation, USA.

B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

C. Height and Type: As indicated on Finish Schedule.

D. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.

E. Outside and Inside Corners: **Preformed.**

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
   1. Adhesives shall have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products until Substantial Completion.

END OF SECTION 09 65 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Rubber floor tile.
   2. Vinyl composition tile.
   3. Luxury vinyl tile.

B. Related Sections:
   1. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   1. Show details of special patterns.

C. Samples for Initial Selection: For each type of floor tile indicated.

D. Samples for Verification: Full-size units of each color and pattern of floor tile required.

E. Product Schedule: Use same designations indicated on Drawings.

F. Qualification Data: For qualified Installer.

G. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
   1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

B. 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.

C. 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 mockups for floor tile including resilient base and accessories.
      a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations directed by Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
   1. 48 hours before installation.

2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 RUBBER FLOOR TILE

A. Basis of Design Manufacturer: Subject to compliance with requirements, provide products by Nora Rubber Hammered Tile as indicated on Finish Schedule or comparable products by one of the following as approved by Architect / Interior Designer:

1. Johnsonite.
2. Roppe Rubber Tile.
3. Tarkett, Inc.

B. Wearing Surface: Hammered.

C. Thickness, Color and Size: As scheduled

2.2 VINYL COMPOSITION FLOOR TILE

A. Basis of Design Manufacturer: Subject to compliance with requirements, provide Standard Excelon Sterling VCT by Armstrong World Industries, Inc. as indicated on Finish Schedule or a comparable product by one of the following as approved by Architect / Interior Designer:

1. AB; American Biltrite.
2. Mannington Mills, Inc.

B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Size: 12 by 12 inches.

F. Colors and Patterns: As scheduled.

2.3 LUXURY VINYL TILE (LVT)

A. High-Performance Luxury Vinyl Plank Standard: ASTM F 1700.

1. Class: Class III, printed film vinyl tile.
2. Type: B, embossed surface.

B. Basis of Design Manufacturer: Subject to compliance with requirements, provide Unveil LVT flooring by Shaw Contract as indicated on Finish Schedule or comparable products by one of the following, as approved by Architect / Interior Designer:

1. Amtico Mannington Commercial.
2. FloorFolio Industries.
3. Mannington Commercial.

4. Mohawk Group.

C. Patterns, Colors, Size and Thickness: As scheduled.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Composition Floor Tile Adhesives: Not more than 50 g/L.
   b. Rubber Floor Tile Adhesives: Not more than 50 g/L.

C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated on the drawings.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
   1. Lay tiles in pattern of colors and sizes indicated.
D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
B. Perform the following operations immediately after completing floor tile installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.
C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
D. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Section Includes: Roller-applied 100% solids, penetrating epoxy primer followed by two (2) roller-applied basecoats of 100% solids epoxy with broadcasts of colored quartz granules, and two (2) grout coats of 100% solids epoxy, to achieve a total system thickness of 1/8" (0.125 mm).

B. This system shall be applied to the prepared substrate(s) as defined by the plans strictly in accordance with the manufacturer's recommendations.

1.02 SUBMITTALS

A. Product Data
1. Current edition of manufacturer's product literature including physical data, chemical resistance, surface preparation, and application instructions.

B. Samples
1. A hard sample of the proposed system shall be submitted to represent the finished floor.

C. Warranty
1. Manufacturer's standard warranty

2. Applicator's standard warranty

1.03 QUALITY ASSURANCE

A. Qualifications
1. The manufacturer shall have a minimum of ten (10) years' experience in the production, sales, and technical support of polymer-based floor coatings.

2. The applicator shall have a minimum of three (3) years' documented experience in the application of polymer floor coatings to concrete floors and be approved by Sherwin Williams.

3. Proposed supplier's products shall provide certification that they have ten (10) years' experience in the production of polymer floor coatings and be required to meet all provisions of this specification as well as provide evidence for compatibility between components to the satisfaction of the Architect.

B. Pre-Bid Conference
1. A pre-bid conference should be held between prospective applicators and the Architect to review surface preparation, application, clean-up procedures, and design issues.

C. Packing and Shipping
1. All materials are to be delivered to the job site in the manufacturer's original packaging. The product code and other identification marks should be clearly marked and visible.

D. Storage and Protection
1. All material is to be stored in a cool, dry place out of the direct sunlight and away from any ignition sources. The applicator should refer to the manufacturer's literature and Material Safety Data Sheets for more information.

2. Material Safety Data Sheets are to be kept on site and made readily available for all personnel.

3. Keep containers sealed and ready for use.

1.04 PROJECT CONDITIONS

A. Environmental Requirements
1. Optimum air and substrate temperature for product application is between 55° F (13° C) and 95° F (35° C). For temperatures outside of this range, consult the manufacturer for product application suggestions.

2. Verify the work environment is properly equipped with vapor barriers and perimeter drains.

3. Maintain proper lighting throughout the work environment; the lighting should be comparable to the final lighting level of the space.

4. Store and dispose of any waste in accordance with regulations of local authorities.

B. Safety Requirements
1. "No Smoking" signs shall be posted throughout the work area prior to application.

2. The Owner shall be responsible for removing any foodstuffs from the work area.

3. Open flames, spark producing tools/items, and ignition sources shall be removed from the work area prior to application.

4. Only work-related personnel shall be allowed within the work area.

1.05 WARRANTY

A. Coordination
1. The manufacturer offers a full, one-year warranty against defects in materials. Warranties concerning the installation of the material are solely the responsibility of the applicator.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Manufacturers: Subject to compliance with requirements, provide Basis of Design product or approved comparable product by one of the following manufacturers, as approved by Architect in writing a minimum of ten (10) days prior to submittal of bid. Comparable product to be determined by Architect as equal to Basis of Design product in design, pattern, content, color, texture, construction, performance and sustainability components.
1. Basis of Design Manufacturer: Subject to compliance with requirements, provide Sherwin Williams Ceramic Carpet; Website: www.sherwinwillilams.com as indicated on Finish Legend or comparable products by one of the following:
   a. Stonhard, Inc.; Website: www.stonhard.com.
   b. Dur-A-Flex, Inc.; Website: www.dur-a-flex.com.

2.02 MATERIALS

A. Primer
1. The primer shall be a 100% reactive, epoxy-based, penetrating primer that exhibits chemical resistance.

B. Basecoats
1. The two (2) basecoats shall consist of a tough, impact-resistant 100% solids epoxy coating appropriate for accepting broadcast aggregate.

C. Broadcast
1. Broadcast BC grade colored quartz aggregate to the point of rejection into the first wet basecoat. Repeat the broadcast into a second basecoat application.

D. Grout Coat(s)
1. Apply grout coat with a flat squeegee, then backroll, using a Clear 100% solids, chemical and UV resistant epoxy. If no optional finish coats are to be used, apply a second grout coat.

E. Optional Topcoat(s)
1. Apply 1 to 2 topcoat(s) of a high performance, color-stable, chemical resistant urethane to enhance the abrasion and chemical resistance of the flooring system.

PART 3 - EXECUTION

3.01 INSPECTION

A. General
1. Examine the areas and conditions where Ceramic Carpet is to be installed and notify the Architect of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected by the contractor in a manner acceptable to the Architect.

3.02 PREPARATION

A. General
1. Consult the manufacturer's recommendations for concrete substrate preparation before proceeding.

B. Patching and Joint Preparation
1. Before application, the floor shall be examined for spalls, pits, holes, cracks, non-functional joints, etc. These must be treated after preparation and before application with the suitable Ceramic Carpet products. For functional or expansion joints, these shall be treated with 100% solids elastomeric resin having a minimum elongation of 150%.

C. Concrete Surfaces
1. Shot-blast, diamond grind or power scarify as required to obtain clean, open, porous concrete. Remove sufficient material to provide a sound surface, free of laitance, glaze, efflorescence, and any bond-inhibiting curing compounds or form release agents. Remove grease, oil, and other penetrating contaminants. Repair damaged and deteriorated concrete to acceptable condition; leave surface free of dust, dirt, laitance, and efflorescence.

D. Materials
1. Mix components when required, and prepare materials according to flooring system manufacturer's instructions.

3.03 APPLICATION

A. General
1. The system shall be installed in the order described below:
    a. Substrate Preparation
    b. Priming
    c. Basecoat & Broadcast Applications
    d. Grout Coat Applications
    e. Optional Finish Coat Applications

2. Concrete surfaces on grade shall have been constructed with a vapor barrier to help protect against the effects of vapor transmission and possible delamination of the system. Refer to manufacturer's concrete preparation instructions for additional recommendations.

3. The surface should be dry prior to application of any of the aforementioned steps. Furthermore, the substrate shall always be kept clean, dry, and free of any contaminants.

4. The handling and mixture of any material associated with the installation of the system shall be in accordance with the manufacturer's recommendations and approved by the Architect.

5. The system shall follow the contours of the substrate unless otherwise specified by the Architect.

6. A neat finish with well-defined boundaries and straight edges shall be provided by the applicator.

B. Priming
1. All areas considered for the application shall be primed with the manufacturer's primer to seal and penetrate the substrate in preparation for applying the basecoat and grout coat.

2. Porous concrete substrates may require additional applications of primer.

C. Basecoat & Broadcast
1. The basecoat shall consist of the manufacturer's approved resin and decorative colored broadcast quality quartz aggregate, installed to resurface the floor, seal the surface and give the floor impact and chemical resistance.

2. Slip-resistant properties are provided through a broadcast of quartz aggregate into each basecoat application.

D. Grout Coat(s)
1. The grout coat(s) and optional topcoat(s) shall be consistent with the manufacturer's recommendations for the system.

E. Optional Topcoat(s)
1. Additional abrasion and chemical resistance may be provided by applying the manufacturer's compatible high-performance urethane.

2. No traffic or equipment shall be permitted on the floor during the curing period.

3.04 FIELD QUALITY CONTROL

A. Tests & Inspection
   1. The following tests shall be performed by the applicator and recorded during application to submit to the Architect:
      a. Temperature during installation
         1. Air
         2. Substrate
         3. Dew Point

3.05 CLEANING

A. Disposal
   1. Properly remove and dispose of any excess materials.

END OF SECTION 09 67 23

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes modular carpet tile.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s product data.

B. Shop Drawings: Show the following:

1. Carpet tile type, color, and dye lot.
2. Pattern of installation.
3. Insets and borders.
4. Edge, transition, and other accessory strips.
5. Transition details to other flooring materials.

C. Samples: For each color and texture required.

1. Two full-size Samples.
2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch-long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

E. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."

B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.7 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, more than 10 percent

loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.

1. Warranty Period: 10 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yds.

PART 2 - PRODUCTS

2.1 CARPET TILE – CPT-1

A. Product: Subject to compliance with requirements, provide Basis of Design product or approved comparable product by one of the following manufacturers, as approved by Architect in writing a minimum of ten (10) days prior to submittal of bid. Comparable product to be determined by Architect as equal to Basis of Design product in design, pattern, content, color, texture, construction, performance and sustainability components.
   1. Shaw Contract Group, as indicated on Finish Legend (BASIS OF DESIGN).
   2. Atlas Commercial.
   3. Masland Commercial.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fiber Content: 100% nylon 6.

C. Fiber Type: 100% solution dyed.

D. Backing System: 100% thermoplastic polyolefin compound with high performance precoat and reinforcing layer, moisture impermeable, PVC-free.

E. Size: As indicated on Finish Legend.

F. Protective Treatment: Manufacturer's standard.

G. Environmental Certifications:
   1. Cradle to Cradle Certification: Silver.
   2. NSF140 Certification: Gold.
   3. Green Label Plus Certified
   4. Health Product Declaration (HPD): 1,000 ppm disclosure
   5. Environmental Product Declaration (EPD): 3rd party certified in accordance with ISO14044, ISO14025 and EN15804
   6. Living Building Challenge (LBC): Free of red list chemicals
   7. Declare: LBC compliant

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

D. Install pattern parallel to walls and borders.

END OF SECTION 09 68 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and field painting and staining of exposed interior and exterior 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.

1.3 SUBMITTALS

A. 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. Submit 2 Samples on the following substrates for Architect's review of color and texture only:
      a. Stained or Natural Wood: 4-by-8-inch Samples of natural- or stained-wood finish on representative maple surfaces.

1.4 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 a 6-ft. x 8-ft. mock-up of all paint colors selected.
   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 sample Architect and Owner prior to Contractor proceeding with painting.

1.5 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 a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.

1.6 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.

1.7 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 extra paint materials in quantities of 1 gallon of each interior and exterior type and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provides by one of the following:

1. Benjamin Moore & Company (Ben Moore).
2. PPG Industries, Inc. (PPG).
3. Sherwin-Williams Co. (Sherwin-Williams).

2.2 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.

C. Colors: As scheduled or as selected by Architect from manufacturer’s full range.

2.3 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. 206: Applied at a dry film thickness of not less than 8.1 mils.
2. PPG; 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.
3. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils.

2.4 EXTERIOR PRIMERS

A. Exterior Soffit and Trim Board Primer: Factory-formulated alkyd- or alkali-resistant acrylic-latex primer for exterior application.
   1. Benjamin Moore; Moorcraft Super Spec Alkyd Exterior Primer No. 176: Applied at a dry film thickness of not less than 1.8 mils.
   2. PPG; 4-603 Perma-Crete Interior/Exterior Acrylic Latex Alkali Resistant Primer: Applied at a dry film thickness of not less than 1.5 mils.
   3. Sherwin-Williams; Multi-Purpose Primer B51-450 Series: Applied at a dry film thickness of not less than 1.4 mils.

B. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.
   1. Benjamin Moore; Super Spec HP Alkyd Metal Primer No. P06: Applied at a dry film thickness of not less than 2.0 mils.
   2. PPG; 6-208 Speedhide Alkyd Metal Primer: Applied at a dry film thickness of not less than 3.0 mils.
   3. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils.

C. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.
   1. Benjamin Moore; Super Spec HP Acrylic Metal Primer No. P04: Applied at a dry film thickness of not less than 2.0 mils.
   2. PPG; 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.
   3. Sherwin-Williams; primer not required over this substrate.

2.5 INTERIOR PRIMERS

A. Interior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.
   1. Benjamin Moore; SuperSpec 100% acrylic Interior/Exterior Masonry Primer, N068: Applied at a dry film thickness of not less than 1.0 mils.
   2. PPG; 4-603 Perma-Crete Interior/Exterior Acrylic Latex Alkali Resistant Primer: Applied at a dry film thickness of not less than 1.5 mil.
   3. Sherwin-Williams; LOXON Concrete & Masonry Primer B24W8300: Applied at a dry film thickness of not less than 3.0 mils.

B. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
   1. Benjamin Moore; Super Hide Interior Latex Primer Undercoater 284: Applied at a dry film thickness of not less than 1.0 mils.
   2. PPG; 12-900 Speedhide Pro-EV Interior Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil.
   3. Sherwin-Williams; Pro-Mar 400 Interior Latex Wall Primer B28W08400: Applied at a dry film thickness of not less than 1.1 mils.

C. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.
   1. Benjamin Moore; Super Spec HP Alkyd Metal Primer No. P06: Applied at a dry film thickness of not less than 2.0 mils.
   2. PPG; 90-712 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 1.5 mils.
   3. Sherwin-Williams; Pro-Cryl Universal Metal Primer B66-310: Applied at a dry film thickness of not less than 2.0 mils.

D. Interior Zinc-Coated Metal Primer: Factory-formulated galvanized metal primer.
   1. Benjamin Moore; Super Spec HP Acrylic Metal Primer No. P04: Applied at a dry film thickness of not less than 2.0 mils.
   2. PPG; 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.
   3. Sherwin-Williams; primer not required over this substrate.

2.6 EXTERIOR FINISH COATS

A. Exterior Low-Luster Acrylic Paint: Factory-formulated low-sheen (satin) acrylic-latex paint for exterior application.
   1. Benjamin Moore; Ultra Spec EXT Satin Finish House Paint No. N448: Applied at a dry film thickness of not less than 1.0 mil.
   2. PPG; 6-2045XI Series SpeedHide Exterior House & Trim Satin--Acrylic Latex: Applied at a dry film thickness of not less than 1.0 mil.
   3. Sherwin-Williams; A-100 Exterior Latex Satin, A82 Series: Applied at a dry film thickness of not less than 1.5 mils.

B. Exterior Semigloss Acrylic Enamel: Factory-formulated semigloss waterborne acrylic-latex enamel for exterior application.
   1. Benjamin Moore; Ultra Spec EXT Gloss Finish No. N449: Applied at a dry film thickness of not less than 1.1 mils.
   2. PPG; 6-900XI Series SpeedHide Exterior House & Trim Semi-Gloss Acrylic Latex Paint: Applied at a dry film thickness of not less than 1.5 mils.
   3. Sherwin-Williams; A-100 Exterior Latex Gloss, A8 Series: Applied at a dry film thickness of not less than 1.3 mils.

2.7 INTERIOR FINISH COATS

A. Interior Flat Latex-Emulsion Size: Factory-formulated flat latex-based interior paint.
   1. Benjamin Moore; Super Hide Interior Latex Flat 282: Applied at a dry film thickness of not less than 1.0 mils.
   2. PPG; 12-110 Series Speedhide Pro-EV Interior Latex Flat Wall Paint: Applied at a dry film thickness of not less than 1.2 mil.
   3. Sherwin-Williams; Pro-Mar 400 Zero VOC Interior Flat B30W400 Series: Applied at a dry film thickness of not less than 1.2 mils.

B. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.
   1. Benjamin Moore; Super Hide Interior Latex Eggshell Enamel 286: Applied at a dry film thickness of not less than 1.0 mils.
   2. PPG; 12-310 Speedhide Pro-EV Interior Latex Eggshell Enamel: Applied at a dry film thickness of not less than 1.3 mils.
   3. Sherwin-Williams; Pro-Mar 400 Interior Eggshell Enamel B20W4400 Series: Applied at a dry film thickness of not less than 1.3 mils

C. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.
   1. Benjamin Moore; Super Hide Interior Latex Semi-Gloss 283: Applied at a dry film thickness of not less than 1.0 mils.
   2. PPG; 12-510 Speedhide Pro-EV Interior Latex Semi-Gloss Enamel: Applied at a dry film thickness of not less than 1.3 mil.
   3. Sherwin-Williams; Pro-Mar 400 Latex Semi-Gloss B21W400 series: Applied at a dry film thickness of not less than 1.3 mils

2.8 INTERIOR WOOD STAINS AND VARNISHES

A. Open-Grain Wood Filler: Factory-formulated paste wood filler applied at spreading rate recommended by manufacturer.
   1. Benjamin Moore; No Longer In Portfolio
   2. PPG; none required.
   3. Sherwin-Williams; Sher-Wood Fast-Dry Filler.

B. Interior Wood Stain: Factory-formulated alkyd-based penetrating wood stain for interior application applied at spreading rate recommended by manufacturer.
   1. Benjamin Moore; Lenmar QuickStain Alkyd Wiping Stain 1AS.12XX
   2. PPG; Olympic Low VOC Interior Semi-Transparent Oil Stain 44500.
   3. Sherwin-Williams; Wood Classics Interior Oil Stain A-48 Series.

C. Clear Sanding Sealer: Factory-formulated fast-drying alkyd-based clear wood sealer applied at spreading rate recommended by manufacturer.
   1. Benjamin Moore; Lenmar Rapid Seal Dual Purpose Sealer No. 1Y.519
   2. PPG; Olympic Waterbased Interior Sanding Sealer 41061.
   3. Sherwin-Williams; Wood Classics Fast Dry Sanding Sealer B26V43.

D. Interior Waterborne Clear Satin Varnish: Factory-formulated clear satin acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.
   1. Benjamin Moore; Stays Clear Acrylic Polyurethane No. 423, Satin.
   2. PPG; Olympic Satin Acrylic Clear Polyurethane 42786.
   3. Sherwin-Williams; Wood Classics Waterborne Polyurethane Satin, A68 Series.

E. Colors and Sheen: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 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.

3.2 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 reprime.

2. Cementitious Materials: Prepare concrete and concrete unit masonry 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.
    c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
    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, cases, and paneling.
    c. If transparent finish is required, backprime with spar varnish.
    d. Backprime paneling on interior partitions where masonry or other wet wall construction occurs on back side.
    e. 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. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
    b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    c. 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. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 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.

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. 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.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 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.

3.5 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. Comply with procedures specified in PDCA P1.

3.6 EXTERIOR PAINT SCHEDULE

A. Concrete and Masonry (Other Than Concrete Unit Masonry); Locations as indicated on Drawings:
   1. Acrylic Finish: Two finish coats over a primer.
      a. Primer: Exterior concrete and masonry primer.
      b. Finish Coats: Exterior low-luster acrylic paint.

B. Concrete Unit Masonry:
   1. Acrylic Finish: Two finish coats finish coats over block filler.
      a. Block Filler: Concrete unit masonry block filler.
      b. Finish Coats: Exterior low-luster acrylic paint.

C. Exterior Gypsum and Glass-Fiber Reinforced Cement Fabrications: Provide the following finish systems over exterior gypsum soffit board:
   1. Low-Luster Acrylic Finish: Two finish coats over a primer.

a. Primer: Exterior gypsum soffit board primer.
b. Finish Coats: Exterior low-luster acrylic paint.

D. Smooth Wood:
1. Acrylic-Enamel Finish: Two finish coats over a primer.
a. Primer: Exterior wood primer for acrylic enamels.
b. Finish Coats: Exterior full-gloss acrylic enamel.

E. Wood Trim:
1. Acrylic-Enamel Finish: Two finish coats over a primer.
a. Primer: Exterior wood trim primer for full-gloss acrylic enamels.
b. Finish Coats: Exterior full-gloss acrylic enamel.

F. Fiber-Cement Trim and Soffit Board:
1. Low-Luster Acrylic Finish: Two finish coats over a primer.
a. Primer: Exterior gypsum soffit board primer.
b. Finish Coats: Exterior low-luster acrylic paint.

G. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
1. Semigloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.
a. Primer: Exterior ferrous-metal primer.
b. Finish Coats: Exterior semigloss acrylic enamel.

H. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:
1. Semigloss Acrylic-Enamel Finish: Two finish coats over a galvanized metal primer.
a. Primer: Exterior galvanized metal primer.
b. Finish Coats: Exterior semigloss acrylic enamel.

3.7 INTERIOR PAINT SCHEDULE

A. Concrete and Masonry (Other Than Concrete Unit Masonry): Provide the following paint systems over interior concrete and brick masonry substrates:
1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
a. Primer: Interior concrete and masonry primer.
b. Finish Coats: Interior low-luster acrylic enamel.

B. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:
1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a block filler.
a. Block Filler: Concrete unit masonry block filler.
b. Finish Coats: Interior low-luster acrylic enamel.

C. Gypsum Board Surfacer / Primer: Level 5 Finish Primer over Level 4 Gypsum Board Finish: Provide a Level 5 gypsum board primer / surfacer product over a minimum Level 4 finish to produce a Level 5 finish without the need for hand-applying a skim coat.
1. Products: Subject to compliance with requirements, provide one of the following:
a. CertainTeed; Level 5 Wall & Ceiling Primer.
b. Sherwin-Williams; Builders Solution.
c. TWI Products; Nucoat Roll-on Level 5 Primer.
d. USG; Tuff Hide.

D. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior low-luster acrylic enamel.
2. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior semigloss acrylic enamel.

E. Wood and Hardboard:

1. Acrylic-Enamel Finish: Two finish coats over a primer.
    a. Primer: Interior wood primer for acrylic-enamel and semigloss alkyd-enamel finishes.
    b. Finish Coats:
        1) Interior trim: Full-gloss acrylic enamel.
        2) Interior doors and panels: Semi-gloss acrylic enamel.

F. Ferrous Metal: Provide the following finish systems over ferrous metal:
    1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
        a. Primer: Interior ferrous-metal primer.
        b. Finish Coats: Interior semigloss acrylic enamel.

G. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:
    1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
        a. Primer: Interior zinc-coated metal primer.
        b. Finish Coats: Interior semigloss acrylic enamel.

H. 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.

END OF SECTION 09 91 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes surface preparation and field application of high-performance coating systems to items and surfaces scheduled.

B. Related Sections include the following:

1. Division 04 Section "Unit Masonry Assemblies" for related concrete masonry unit requirements.

1.3 DEFINITIONS

A. Standard coating terms defined in ASTM D 16 apply to this Section.

B. Gloss ranges used in this Section include the following:

1. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
2. High gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

C. Environments: The following terms are used in Part 2 of this Section to distinguish between different corrosive exposures:

1. "Moderate environments" are corrosive industrial atmospheres with intermittent exposure to high humidity and condensation, occasional mold and mildew development, and regular cleaning with strong chemicals. Environments with exposure to heavy concentrations of chemical fumes and occasional splashing and spilling of chemical products are moderate environments.
2. "Mild environments" are industrial atmospheres with normal exposure to moderate humidity and condensation, occasional mold and mildew development, and infrequent cleaning with strong chemicals. Environments with low levels of mild chemical fumes and occasional splashing and spilling of chemical products are mild environments. Normal outdoor weathering is also considered a mild environment.

1.4 SUBMITTALS

A. Product Data: For each coating system indicated. Include block fillers and primers.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the 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 material specified.

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. List of material and application for each coat of each sample. Label each sample for location and application.
3. Submit samples on the following substrates for Architect's review of color and texture:
   a. Concrete: Provide two 4-inch- square samples for each color and finish.
   b. Concrete Masonry: Provide two 8-inch- square samples of masonry, with mortar joint in the center, for each finish and color.
   c. Ferrous and Nonferrous Metal: Provide two 4-inch- square samples of flat metal and two 8-inch- long samples of solid metal for each color and finish.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed high-performance coating system applications similar in material and extent to those indicated for Project and whose work has a record of successful in-service performance.

B. Source Limitations: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of 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, area, 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. of wall surface.
   b. Small Areas and Items: Architect will designate items or areas required.
2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface as specified. Provide the required sheen, color, and texture of 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:

1. 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. Handling instructions and precautions.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect materials from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

1.7 PROJECT CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 45 and 95 deg F.

B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before proceeding with or continuing coating operation.
2. Work may continue during inclement weather only if areas and surfaces to be coated are enclosed and temperature within the area can be maintained within limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated in the coating system descriptions.

B. Manufacturers' Names: The following manufacturers are referred to in the coating system descriptions by shortened versions of their names shown in parenthesis:

1. Carboline Company (Carboline).
2. Pittsburgh Paint; PPG Industries, Inc. (PPG).
3. Tnemec Company, Inc. (Tnemec).

2.2 COATINGS MATERIALS, GENERAL

A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's highest grade of the various high-performance coatings specified. Materials not displaying manufacturer's product identification are not 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.

2.3 COLORS

A. Colors: As selected by Architect from manufacturer's full range.

2.4 EXTERIOR HIGH-PERFORMANCE COATING SYSTEMS

A. Ferrous Metal: Provide the following finish systems over exterior ferrous-metal surfaces, including metal canopies and architecturally exposed exterior steel:

1. Moderate Environment (Semigloss Finish): One finish coat over an intermediate coat and a primer.
   a. Primer: Epoxy primer applied at spreading rate recommended by manufacturer.
      1) Carboline: 893 2-Component Cross-Linked Epoxy.
      2) PPG: 97-14XX Series Pitt-Guard DTR Polyamide Epoxy Coating.
      3) Tnemec: Series 27 F. C. Typoxy Polyamide Epoxy.
   b. Intermediate Coat: Epoxy applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 8.0 mils.
      1) Carboline: 890 2-Component Epoxy.
      2) Tnemec: Series 66 Hi-Build Epoxoline Polamidoamine Epoxy.
   c. Intermediate Coat: Aliphatic polyurethane enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.5 to 4.0 mils.
      1) PPG: 97-84XX Series Pitthane High Build Acrylic-Aliphatic Urethane Enamel.
   d. Topcoat: Aliphatic polyurethane enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.5 to 4.0 mils.
      1) Carboline: Carboline 133 HB Aliphatic Polyurethane.
      2) PPG: 97-84XX Series Pitthane High Build Acrylic-Aliphatic Urethane Enamel.
      3) Tnemec: Series 75 Endura-Shield.

B. Nonferrous Metal: Provide the following finish systems over exterior nonferrous-metal surfaces:

1. Moderate Environment (Semigloss Finish): One finish coat over an intermediate coat and a primer.
   a. Primer: Epoxy primer applied at spreading rate recommended by manufacturer.
      1) Carboline: Rustbond Penetrating Sealer SG.
      2) PPG: 97-14XX Series Pitt-Guard DTR Polyamide Epoxy Coating.
      3) Tnemec: Series 27 F. C. Typoxy Polyamide Epoxy.

b. Intermediate Coat: Epoxy applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 3.0 to 5.0 mils.
   1) Carboline: 890 2-Component Epoxy.
   2) Tnemec: Intermediate coat not required.
c. Intermediate Coat: Aliphatic polyurethane enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.5 to 4.0 mils.
   1) PPG: 97-84XX Series Pitthane High Build Acrylic-Aliphatic Urethane Enamel.
   2) Tnemec: Intermediate coat not required.
d. Topcoat: Aliphatic polyurethane enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.5 to 4.0 mils.
   1) Carboline: 133 HB Aliphatic Polyurethane.
   2) PPG: 97-84XX Series Pitthane High Build Acrylic-Aliphatic Urethane Enamel.
   3) Tnemec: Series 75 Endura-Shield.

2.5 INTERIOR HIGH-PERFORMANCE COATING SYSTEMS

A. Concrete and Masonry (Other Than Concrete Masonry Units): Provide the following finish systems over interior concrete and brick masonry wall surfaces:
   1. Mild Environment (Semigloss Finish): One finish coat over an intermediate coat and a primer.
      a. Primer: Acrylic primer applied at spreading rate recommended by manufacturer.
         1) Carboline: Multi-Bond 120 Waterborne Acrylic Primer.
         2) PPG: 6-603 Speedhide Interior/Exterior Acrylic Latex Alkali Resistant Primer.
         3) Tnemec: Series 29 Tufcryl Acrylic Emulsion.
      b. Intermediate Coat: Waterborne acrylic enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.5 to 4.0 mils.
         1) Carboline: 3359 Water-Borne Acrylic.
         2) PPG: 90-4XX Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne Satin DTM Industrial Enamel.
         3) Tnemec: Intermediate coat not required.
      c. Topcoat: Semigloss acrylic emulsion applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.5 to 4.0 mils.
         1) Carboline: 3359 Water-Borne Acrylic.
         2) PPG: 90-4XX Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne Satin DTM Industrial Enamel.
         3) Tnemec: Series 29 Tufcryl Acrylic Emulsion.

B. Concrete Floor Sealer: Provide the following finish systems over interior concrete floors indicated to receive sealer:
   1. Moderate Environment (Gloss Finish): Two finish coats, two-Component, Aliphatic Polyurethane, Clear, applied at spreading rate recommended by manufacturer.
      a. PPG Architectural Finishes, Inc.; Pitthane, Polyurethane Aliphatic 2 Comp. Clear, 95-8000.
      b. Tamms Industries, Inc.; Dural 1004C.

C. Concrete Masonry Units: Provide the following finish systems over interior concrete masonry block:
   1. Mild Environment (Semigloss Finish): One finish coat over an intermediate coat and a block filler.
      a. Block Filler: Acrylic or epoxy block filler applied at spreading rate recommended by manufacturer as sufficient to fill pores.
         1) Carboline: Flexide Masonry Block Filler.
         2) PPG: 16-90 Pitt-Glaze High Performance Acrylic Latex Block Filler.
         3) Tnemec: Latex Masonry Block Filler.

b. Intermediate Coat: Acrylic enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.5 to 4.0 mils.
   1) Carboline: 3359 Water-Borne Acrylic.
   2) PPG: 90-4XX Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne Satin DTM Industrial Enamel.
   3) Tnemec: Series 29 Tuf-Cryl Water Based Acrylic Emulsion.
c. Topcoat: Semigloss acrylic enamel applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.5 to 4.0 mils.
   1) Carboline: 3359 Water-Borne Acrylic.
   2) PPG: 90-4XX Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne Satin DTM Industrial Enamel.
   3) Tnemec: Series 28 Tuf-Cryl Water Based Acrylic Emulsion.

D. Ferrous Metal: Provide the following finish systems over interior ferrous-metal surfaces, including all handrails and guardrails:
   1. Moderate Environment (High-Gloss Finish): One finish coat over an intermediate coat and a primer.
      a. Primer: Epoxy primer applied at spreading rate recommended by manufacturer.
         1) Carboline: 888 2-Component Polyamide Epoxy.
         2) PPG: 97-14XX Series Pitt-Guard DTR Polyamide Epoxy Coating.
         3) Tnemec: 27 F. C. Typoxy Polyamide Epoxy.
      b. Intermediate Coat: Epoxy applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.0 to 4.0 mils.
         1) Carboline: 890 2-Component Epoxy.
         2) PPG: 97-1XXX Series Aquapon Polyamide-Epoxy Coating.
         3) Tnemec: Series 84 H. S. Epoxy.
      c. Topcoat: High-gloss epoxy applied at spreading rate recommended by manufacturer to achieve a dry film thickness of 1.0 to 4.0 mils, unless otherwise indicated.
         1) Carboline: 890 2-Component Epoxy.
         2) PPG: 97-1XXX Series Aquapon Polyamide-Epoxy Coating.
         3) Tnemec: Series 84 H. S. Epoxy.

E. Gypsum Board: Provide the following finish systems over interior gypsum board:
   1. Mild Environment (Semigloss Finish): One finish coat over an intermediate coat.
      a. Primer: Primer applied at spreading rate recommended by manufacturer.
         1) Carboline: 100 percent acrylic primer.
         2) PPG: Seal Grip 100 percent acrylic primer.
         3) Tnemec: 27 F. C. Typoxy Polyamide Epoxy.
      b. Intermediate and Top Coats: Acrylic enamel applied at spreading rate recommended by manufacturer to achieve a total dry film thickness of 3.0 to 4.0 mils.
         1) Carboline: 3359 Water-Borne Acrylic.
         2) PPG: 90-474 Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne Satin DTM Industrial Enamel.
         3) Tnemec: Series 29 Semi-Gloss Acrylic Emulsion.

PART 3 - EXECUTION

3.1 EXAMINATION

A. With Applicator present, examine substrates and conditions under which high-performance coatings will be applied, for compliance with coating application requirements.
   1. Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.
   2. Start of application is construed as Applicator's acceptance of surfaces within that particular area.

B. Coordination of Work: Review other Sections in which primers or other coatings are provided to ensure compatibility of total systems for various substrates. On request, furnish information on characteristics of specified finish materials to ensure compatible primers.
   1. If a potential incompatibility of primers applied by others exists, obtain the following from the primer Applicator before proceeding:
      a. Confirmation of primer's suitability for expected service conditions.
      b. Confirmation of primer's ability to be top coated with materials specified.
   2. Notify Architect about anticipated problems before using the coatings specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
   1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.

B. Cleaning: Before applying high-performance coatings, clean substrates of substances that could impair bond of coatings. Remove oil and grease before cleaning.
   1. Schedule cleaning and coating application so dust and other contaminates from cleaning process will not fall on wet, newly coated surfaces.

C. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for each substrate condition and as specified.
   1. Provide barrier coats over incompatible primers or remove primers and reprime substrate.
   2. Cementitious Substrates: Prepare concrete, brick, concrete masonry block, and cement surfaces to be coated. 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 to prepare surfaces.
      a. Use abrasive blast-cleaning methods if recommended by coating 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 coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
      c. Concrete Floor to Receive Urethane Coating: Prepare concrete floor in strict accordance with urethane manufacturer’s recommendations prior to beginning installation of urethane coating.
   3. Ferrous-Metal Substrates: 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 recommendations.
      a. Blast-clean steel surfaces as recommended by coating manufacturer and according to SSPC-SP 10/NACE No. 2.
      b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
      c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, solvent clean, and touch up with same primer as the shop coat.
   4. Nonferrous-Metal Substrates: Clean nonferrous and galvanized surfaces according to manufacturer's written instructions for the type of service, metal substrate, and application required.
      a. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
   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: Carefully mix and prepare coating materials according to manufacturer's written instructions.
   1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
   2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
   3. Use only the type of thinners approved by manufacturer and only within recommended limits.

E. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply high-performance coatings according to manufacturer's written instructions.
   1. Use applicators and techniques best suited for the material being applied.
   2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
   3. Coating colors, surface treatments, and finishes are indicated in the coating system descriptions.
   4. Provide finish coats compatible with primers used.
   5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, grilles, 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.
      a. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
      b. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
   1. The number of coats and film thickness required is the same regardless of application method.
      a. Omit primer on metal surfaces that have been shop primed and touchup painted.
      b. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
      c. Where manufacturer's written instructions require sanding, sand between applications to produce a smooth, even surface.
      d. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.
   2. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.

C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
   1. Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated.
      a. Apply primers and first coats by brush unless manufacturer's written instructions permit using roller or mechanical applicators.

b. Brush out and work brush coats into surfaces in an even film.
c. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.

2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for the material and texture required.
3. Spray Equipment: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations.
   a. Use spray equipment with orifice size recommended by manufacturer for material and texture required.
   b. Apply each coat to provide the equivalent hiding of brush-applied coats.
   c. Do not double back with spray equipment building-up film thickness of two coats in one pass, unless recommended by manufacturer.

D. Minimum Coating Thickness: Apply each material no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by manufacturer, to material required to be coated or finished that has not been prime coated by others.
   1. Recoat primed and sealed substrates if there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat with no burn-through or other defects caused by insufficient sealing.

G. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

3.4 CLEANING

A. Cleanup: At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
   1. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
   1. Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.
   2. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces. Comply with procedures specified in PDCA P1.

END OF SECTION 09 96 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes visual display surfaces:
   1. Markerboards.
   2. Tackboards.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.

B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of panel joints.
   2. Include sections of typical trim members.

C. Samples for Verification: For each type of visual display surface indicated.
   1. Visual Display Surface: Not less than 8-1/2 by 11 inches, mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
   2. Trim: 6-inch- long sections of each trim profile.
   3. Display Rail: 6-inch- long sections.
   4. Accessories: Full-size Sample of each type of accessory.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

E. Product Certificates: Signed by manufacturers of tackboards certifying that tackboard materials furnished comply with requirements specified for flame-spread ratings.

F. Operation and Maintenance Data: For visual display surface units to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate appearance and aesthetic effects and set quality standards for installation.

1.5 WARRANTY

A. Porcelain Enamel Markerboard Warranty: Submit a written warranty executed by manufacturer agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking within the specified warranty period, provided the manufacturer's written instructions for handling, installation, protection, and maintenance have been followed.
   1. Materials and Workmanship for Porcelain-Enamel Face Sheets: 50 years from date of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display surfaces vertically with packing materials between each unit.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products as specified by one of the following:

1. Claridge Products and Equipment, Inc.
2. ADP Lemco, Inc.
3. PolyVision Corporation.

2.2 VISUAL DISPLAY BOARDS

A. Porcelain Enamel Markerboards: Balanced, high-pressure-laminated, porcelain enamel markerboards of 3-ply construction consisting of face sheet, core material, and backing.

1. Face Sheet: 0.024-inch enameling grade steel especially processed for temperatures used in coating porcelain on steel. Coat exposed face and edges with a 3-coat process consisting of primer, ground coat, and color cover coat. Coat concealed face with a 2-coat process consisting of primer and ground coat. Fuse cover and ground coats to steel at manufacturer's standard firing temperatures, but not less than 1200 deg F.
   a. Cover Coat for Markerboards: Provide manufacturer's standard, light-colored, special writing surface with gloss finish intended for use with erasable dry markers.
2. Core: 3/8-inch-thick, particleboard core material complying with requirements of ANSI A208.1, Grade 1-M-1.
   a. Particleboard: ANSI A208.1, Grade M-1, made with binder containing no urea formaldehyde.
3. Backing Sheet: 0.015-inch-thick, aluminum-sheet backing.

B. Linoleum Tackboards: 1/4-inch-thick, seamless sheet consisting of oxidized linseed or other vegetable drying oil and rosin, mixed with ground cork or wood flour, mineral filler, and pigments on natural burlap backing. Provide color and texture as indicated in Finish Schedule.

1. Laminating Adhesive: Manufacturer's standard, moisture-resistant, thermoplastic-type adhesive.

C. Adhesive: Mildew-resistant, nonstaining adhesive, for use with specific tack wall panels and substrate application, as recommended in writing by visual display surface manufacturer.

D. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch- thick, extruded-aluminum alloy, to suit type of installation. Provide straight, single-length units. Keep joints to a minimum. Miter corners to a neat, hairline closure.

1. Marker Tray: Manufacturer's standard, continuous, box-type, aluminum tray with slanted front and cast-aluminum end closures for each markerboard.
2. Display Rail: Provide continuous cork display rail approximately 1 or 2 inches wide, at top of markerboards.

2.3 FABRICATION

A. Porcelain Enamel Markerboards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.

B. Assembly: Provide factory-assembled markerboard and tackboard units, unless field-assembled units are required.

1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
2. Provide manufacturer's standard vertical joint system between abutting sections of visual display boards.
3. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards.

2.4 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

C. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine wall surfaces, with Installer present, for compliance with requirements and other conditions affecting installation of visual display boards.

1. Surfaces to receive visual display boards shall be free of dirt, scaling paint, and projections or depressions that would affect smooth, finished surfaces of boards.
2. Surfaces to receive tackboards shall be dry and free of substances that would impair the bond between tackboards and substrate.
3. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Deliver factory-built visual display boards completely assembled in one piece without joints, where possible. If dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install units in locations and at mounting heights indicated and according to manufacturer's written instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.3 ADJUSTING AND CLEANING

A. Verify that accessories required for each unit have been properly installed and that operating units function properly.

B. Clean units according to manufacturer's written instructions.

END OF SECTION 10 11 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Building dedication plaque.
   2. Signage for Building Code compliance:
      a. Coordinate with Owner-furnished signage requirements.

B. Related Sections and Documents include the following:
   1. See Mechanical Drawings for labels, tags, and nameplates for mechanical equipment.
   2. See Electrical Drawings for labels, tags, and nameplates for electrical equipment.
   3. See Electrical Drawings and Specifications for illuminated exit signs, and for electrical service and connections for illuminated characters and for access to remote transformers, if required.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
   1. Provide message list for each sign, including large-scale details of wording, lettering, and Braille layout.

C. Samples for Initial Selection: For each type of sign material indicated that involves color selection.

D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
   1. Plaque Casting: 6 inches square.

E. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each sign type through one source from a single manufacturer.

B. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.
   1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
      a. Illuminated Exit Signs.
      b. Fire Doors.
      c. Signs for Accessible Spaces.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
   1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
   1. Color: As selected by Architect from manufacturer's full range.
B. Molded Plastic Characters: Thermoformed or Injection molded.
C. Tactile Characters: Characters and Grade 2 Braille raised 1/32-inch above surface with contrasting colors.

2.2 DEDICATION PLAQUE

A. Cast Plaque: Provide castings free of pits, scale, sand holes, and other defects, as follows:
   1. Plaque Material: Bronze.
   2. Background Texture: Manufacturer's standard pebble texture.
   3. Border Style: Single flat band.
   4. Mounting: Concealed studs, noncorroding for substrates encountered, unless otherwise indicated.
   5. Plaque Size: 22-inches x 14-inches.
   6. Character Size and Text/Message: As indicated on Drawings.
   7. Location: In Main Lobby as directed by Architect.

2.3 DIMENSIONAL CHARACTERS

A. Cutout Characters: Prismatic aluminum peg letters with uniform faces; smooth edges; precisely formed lines and profiles; and as follows:
   1. Character Height: 18 inches.
   2. Thickness: Manufacturer's standard for size of character.
   3. Finishes:
      a. Integral Aluminum Finish: Clear anodized.
      b. Overcoat: Clear organic coating.
   4. Mounting: Concealed studs.
   5. Typeface: Times Roman.
   6. Text: As indicated on Drawings.
B. Mounting Methods: Use concealed fasteners fabricated from materials that are not corrosive to sign material and mounting surface.
C. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.4 FINISHES, GENERAL

A. Protect mechanical finishes on exposed surfaces from damage by applying 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 range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Bracket-Mounted Units: Provide manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.

C. Cast-Metal Plaque: Mount plaque using standard fastening methods to comply with manufacturer's written instructions for type of wall surface indicated.

1. Concealed Mounting: Mount plaque by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting cement.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 10 14 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes solid polymer plastic (HDPE) toilet compartments as follows:
   1. Toilet Enclosures: Floor anchored, overhead braced.
   2. Urinal Screens: Floor anchored, overhead braced.

B. Related Sections include the following:
   1. Division 05 Section "Metal Fabrications" for supports that attach floor-and-ceiling-anchored compartments to overhead structural system.
   2. Division 06 Section "Miscellaneous Rough Carpentry" for blocking and overhead support of floor-and-ceiling-anchored compartments.
   3. Division 10 Section "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, and similar accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of cutouts for compartment-mounted toilet accessories.
   2. Show locations of reinforcements for compartment-mounted grab bars.
   3. Show locations of centerlines of toilet fixtures.
   4. Show ceiling grid and overhead support or bracing locations.

C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.

D. Samples for Verification: If toilet compartment finishes are indicated on Finish Schedule, submit samples for verification of each color/finish selected.

E. Product Certificates: For each type of toilet compartment, from manufacturer.

F. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.

C. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating toilet compartments without field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 TOILET COMPARTMENTS AND SCREENS

A. Products: Subject to compliance with requirements, provide products by one of the following:

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation.
3. Metpar Corporation.

2.2 SOLID PHENOLIC, MOISTURE RESISTANT PARTITIONS

A. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) or polypropylene (PP) panel material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color and pattern throughout thickness of material.

1. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
2. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.
3. Doors and Panel Dimensions:
   a. Finished to not less than 1 inch thick.
   b. Door Width: 24 inches.
   c. Door Width for Handicapped Use: 36 inches out-swing.
   d. Height: 58 inches.
4. Thickness of Pilasters: 1-1/4 inches thick.

B. Urinal-Screen Style: Wall hung flat panel.

C. Urinal-Screen Construction:

1. Flat-Panel Urinal Screen: Matching panel construction.

D. Color and Pattern: As selected by Architect from manufacturer's full range, with manufacturer's standard.

2.3 ACCESSORIES

A. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than 3 inches high, finished to match hardware.

B. Head Rails: Hollow chrome plated steel tube, 1 x 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.

C. Wall and Pilaster Brackets: Stainless steel.

D. Support Posts for Urinal Screens: Manufacturer's standard aluminum post with floor shoe for anchoring to floor construction.

E. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.

1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.

F. Hardware: Polished chrome plated non-ferrous cast metal:

1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.

2. Thumb turn door latch with exterior emergency access feature.
3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
4. Coat hook with rubber bumper; one per compartment, mounted on door.
5. Provide pull for outswinging doors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify correct spacing of and between plumbing fixtures.
C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's written instructions.
B. Maintain 3/8-to- ½-inch space between wall and panels and between wall and end pilasters.
C. Attach panel brackets securely to walls using anchor devices.
D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.3 TOLERANCES

A. Maximum Variation from True Position: ¼-inch.
B. Maximum Variation from Plumb: 1/8-inch.

3.4 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
C. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 21 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Public-use washroom accessories.
   2. Public-use shower room accessories.
   3. Underlavatory guards.
   4. Custodial accessories.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.
   5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated on Drawings.
   2. Identify products using designations indicated on Drawings.

C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 PUBLIC-USE WASHROOM AND SHOWER ROOM ACCESSORIES

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. products as indicated in Toilet Accessory Schedule and as specified below, or a comparable product by one of the following:
   1. A & J Washroom Accessories, Inc.
   2. American Specialties, Inc.
   3. Bradley Corporation.
   4. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.

B. Toilet tissue dispenser.

C. Paper towel dispenser.

D. Paper towel / Waste dispenser.

E. Grab bars; 18", 24", 36", and 42".
F. Soap dispenser; counter.
G. Soap dispenser; wall.
H. Sanitary napkin disposal
I. Seat cover dispenser
J. Mirror.
K. Coat hook.
L. Trash can.
M. Diaper changing station
N. Shower Curtain Rod:
    1. Description: 1-1/4-inch OD; fabricated from nominal 0.05-inch- thick stainless steel.
    2. Mounting Flanges: Stainless-steel flanges designed for exposed fasteners.
    3. Finish: No. 4 (satin).
O. Folding Shower Seat:
    1. Configuration: L-shaped seat, designed for wheelchair access.
    2. Seat: Stainless steel, No. 4 finish (satin); 0.05-inch minimum nominal thickness; with single-piece, pan-type construction and edge seams welded and ground smooth.
    3. Mounting Mechanism: Stainless steel, No. 4 finish (satin).
    4. Dimensions: As indicated on Drawings.

2.2 UNDERLAVATORY GUARDS

A. Underlavatory Guard:
    1. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.
    2. Material and Finish: Antimicrobial, molded-plastic, white.
B. Basis of Design Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    1. Plumberex Specialty Products, Inc.
    2. Truebro by IPS Corporation.

2.3 CUSTODIAL ACCESSORIES

A. Mop and Broom Holder: Bobrick B-223 x 24.
    1. Description: Unit with holders.
    2. Length: 24 inches.
    3. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
    4. Material and Finish: Stainless steel, No. 4 finish (satin).

2.4 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.
C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
G. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.5 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

C. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET ACCESSORY SCHEDULE

A. Provide products as indicated Toilet Accessory Schedule on Drawings.

END OF SECTION 10 28 00

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Portable fire extinguishers.
   2. Fire extinguisher cabinets.
   3. Mounting brackets for fire extinguishers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Fire Extinguishers: Include rating and classification.

B. Maintenance data.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 PORTABLE FIRE EXTINGUISHERS

A. Available Manufacturers:
   1. JL Industries, Inc.
   2. Larsen's Manufacturing Company.
   3. Potter Roemer; Div. of Smith Industries, Inc.

B. General: Provide fire extinguishers of type, size, and capacity for each indicated.
   1. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

C. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 FIRE-PROTECTION CABINET

A. Available Manufacturers:
   1. JL Industries, Inc.
   2. Larsen's Manufacturing Company.
   3. Potter Roemer; Div. of Smith Industries, Inc.

B. Cabinet Construction: Nonrated.

C. Cabinet Material: Stainless-steel sheet.

D. Semi-Recessed Cabinet: Cabinet box semi-recessed in walls of sufficient depth to suit style of trim indicated.
   1. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: Stainless-steel sheet.

G. Door Style: As selected by Architect.

H. Door Glazing: Clear, transparent acrylic sheet.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Provide concealed hinge permitting door to open 180 degrees.

J. Accessories:
   1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, with plated or baked-enamel finish.
   2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
      a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
         1) Location: Applied to cabinet door.
         2) Application Process: Silk-screened.
         3) Lettering Color: Red.
         4) Orientation: Vertical.
   3. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by batteries low voltage, complete with transformer.

K. Finishes:
   1. Stainless Steel: Satin, directional polish, No. 4.

2.4 MOUNTING BRACKETS (FOR EXTINGUISHERS WITHOUT CABINETS)

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
   1. Color: Black.

2.5 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth.
   1. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
   1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
   2. Miter and weld perimeter door frames.
C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.
B. Examine fire extinguishers for proper charging and tagging. Remove and replace damaged, defective, or undercharged units.
C. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.
D. Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
E. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
   1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire-protection cabinets.
   2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
F. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
G. Identification: Apply vinyl lettering at locations indicated.
H. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION 10 44 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes the following:
   1. Locker units with hinged doors.
   2. Metal tops and filler panels.
   3. Locker benches.

1.3 SUBMITTALS

A. Product Data: Provide data on locker types, sizes and accessories and locker benches. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.

B. Shop Drawings: Indicate plans, elevations, sections, details, locker plan layout, numbering plan, combination lock code, and attachments to other work.

C. Samples: Submit two samples 3 x 6 inches in size, of each color and finish scheduled; applied to specified base metal.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect locker and bench finish and adjacent surfaces from damage.

PART 2 - PRODUCTS

2.1 METAL LOCKERS

A. Manufacturers: Subject to compliance with requirements, provide one of the following:
   1. Lyon Workspace Products.
   2. Penco Products, Inc.
   3. Republic Storage Systems Co.

2.2 LOCKER MATERIALS

A. Sheet Steel: Mild, cold rolled and leveled unfinished steel; to the following minimum thicknesses:
   1. Body and Shelf: 24 gauge; 0.024 inch.
   2. Door Outer Face: 18 gauge; 0.048 inch.
   3. Door Inner Face: 20 gauge; 0.036 inch.
   4. Door Frame: 16 gauge; 0.060 inch.
   5. Hinges: 14 gauge; 0.075 inch.
   6. Sloping Top: 20 gauge; 0.036 inch.
   7. Trim: 20 gauge; 0.036 inch.
   8. Louvers: Manufacturer’s standard.

2.3 LOCKER ACCESSORIES

A. Accessories for Each Locker: Two single prong wall hooks.

2.4 LOCKER DOOR HANDLES AND LATCHING

A. Two Tier: Multi-point Latching:
   1. Chrome-plated zinc alloy die-cast case and handle, 40,000 psi maximum tensile strength.
   2. Attachment to latch bar concealed inside door and tamperproof; pulling handle out shall move latch bar up and open door in one motion.

3. Padlock Eye: For use with 9/32-inch diameter padlock, integral with handle and located so that extension of handle forms padlock strike.
4. Case: Kick-proof type shielding movable part and providing padlock strike to prevent scratching and marring the door.
5. Provide lock hole cover plate for use with padlocks.
6. Latch Clip: Glass-filled nylon engaging the door frame and holding the door shut.
   a. Doors: Two points.
7. Locking Device: Positive, automatic type, whereby locker may be locked when open, then closed without unlocking.
8. Firmly secure one rubber silencer in frame at each latch hook.
9. Multi-point latching with recessed handles (Basis of Design is Classic III):
   a. Recess finger-lift control handle in door.
   b. Pocket: 22 gauge brushed stainless steel securely fastened to door with two tabs and a positive tamper-resistant decorative fastener; of depth sufficient to prevent a combination padlock, built-in combination lock, or key lock from protruding beyond door face.
   c. Provide lock hole cover plate for use with padlocks.
   d. Attach 14 gauge formed steel lifting piece to latching channel with one concealed retaining lug and one rivet, assuring a positive two-point connection.
   e. Handle finger lift: Molded, sound-deadening, attached with rivet; padlock eye for use with 9/32-inch diameter padlock shackle.
   f. Latch Clip: Glass-filled nylon engaging the door frame and holding the door shut.
      1) Doors 20 inches to 48 inches high: Two points.
   g. Locking Device: Positive, automatic type, whereby locker may be locked when open, then closed without unlocking.
   h. Firmly secure one rubber silencer in frame at each latch hook.
10. Latch shall be ADA compliant.

2.5 LOCKER INTERIOR EQUIPMENT

A. ADA-Compliant Lockers (Recessed Handles with Multi-Point Latch):
   1. Locker Bottom: Minimum of 9 inches off the floor; an extra shelf placed 9 inches off the floor for side access; minimum of 15 inches off the floor for front access.
   2. Handicapped symbol attached to door.
   3. Hooks as specified for other lockers.

2.6 LOCKER FINISHING

A. Enamel powder coat paint finish electrostatically applied and properly cured to manufacturer's specifications for optimum performance. Finishes containing volatile organic compounds and subject to out-gassing are not acceptable. Locker exterior and interior shall be painted the same color.
   1. Powder Coat: Dry Thickness: 1 to 1.2 mils.
B. Color: Paint locker units 1 color, as selected by Architect.

2.7 LOCKER BENCHES AND PEDESTALS

A. Provide bench units with overall assembly height of 17-1/2 inches.
B. Bench Tops: Stainless steel 16 gauge; 12 inches wide by 1-1/2 inches high; #304 grade polished brushed finish, equipped with a stainless-steel weld nut to accept bolts for fastening pedestals. Corners are TIG welded and cleaned.
C. Bench Pedestals: #201 grade stainless steel with a 14-gauge column and 11 gauge 8-1/2 inches diameter mounting plates.
   1. Provide stainless steel bolts and locking washers for fastening the pedestals to bench top.
   2. Floor anchors provided by others

PART 3 - EXECUTION

3.1 INSTALLATION - LOCKERS

A. Install lockers in accordance with manufacturer's instructions.
B. Install lockers plumb and square.
C. Place and secure on prepared base.
D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100-lbs.
E. Install end panels, filler panels, and sloped tops.
F. Install accessories.
G. Replace components that do not operate smoothly.

3.2 INSTALLATION – LOCKER BENCHES

A. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor in accordance with manufacturer’s instructions.

3.3 ADJUSTING AND CLEANING

A. Clean, lubricate, and adjust locker hardware. Adjust doors and latches to operate easily without binding.
B. Clean locker interiors and exterior surfaces.

END OF SECTION 10 51 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Post-and-shelf metal storage shelving.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance for Post-and-Beam Metal Storage Shelving: Provide metal storage shelving capable of withstanding the loads indicated when tested according to MH 28.2, "Specification for the Design and Testing of Metal--Wood Shelving."

1.4 SUBMITTALS

A. Product Data: Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.

B. Shop Drawings: Show installation details for metal storage shelving, including upright-to-shelf/arm connections, lateral bracing, and attachments to other work. Include plans, elevations, sections, details, and relationship to other work.

C. Maintenance Data: For metal storage shelving to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain metal storage shelving through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal storage shelving and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
   1. Do not modify intended structural performance and aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal storage shelving palleted, wrapped, or crated to provide protection during transit and Project-site storage.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install metal storage shelving until spaces are enclosed and weatherproof, wet work in spaces is completed and dry, and ambient temperature is being maintained at the levels indicated for Project when occupied for its intended use.

1.8 WARRANTY

A. Provide 15-year warranty against rust and corrosion on posts and frames and a lifetime warranty on shelf units.

1.9 COORDINATION

A. Coordinate sizes and locations of blocking and backing required for installation of metal storage shelving attached to wall assemblies.

B. Coordinate locations and installation of metal storage shelving that may interfere with ceiling systems including lighting, HVAC, and sprinklers.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

C. Steel Tubing: ASTM A 513, Type 2.

2.2 POST-AND-SHELF METAL STORAGE SHELVING

A. Open Post-and-Shelf Metal Storage Shelving; Sheet A11.01: Factory-formed, field-assembled, post-and-shelf metal storage shelving system; designed for shelves to span between and be supported by corner posts, with shelves adjustable over the entire height of shelving unit. Fabricate initial shelving unit with a post at each corner. Fabricate additional shelving units similarly, so each unit is independent. Provide fixed top and bottom shelves, adjustable intermediate shelves, and all accessories required and recommended by manufacturer for installation indicated.
   1. Basis-of-Design Product: MetroMax Q adjustable storage rack system with antimicrobial product protection; 24” x 48” injection molded polypropylene shelving, Item #Q2448G (four shelves per unit); 74” adjustable electroplated, epoxy finished steel posts – Item #Q74PE (four per unit), or a comparable product by one of the following:
   2. Manufacturers: Subject to compliance with requirements, provide either the named product or a comparable product by one of the following:
      a. Lyon Metal Products, Inc.
      b. Penco Products, Inc.
      c. Spacesaver Corporation.
      d. Tennsco Corp.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine floors for suitable conditions where metal storage shelving will be installed.

C. Examine walls to which metal storage shelving will be attached for properly located blocking, grounds, or other solid backing for attachment of support fasteners.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Vacuum finished floor over which metal storage shelving is to be installed.

3.3 INSTALLATION

A. Install metal storage shelving level, plumb, square, rigid, and true.
   1. Install in accordance with manufacturer's written instructions and as required for stability. Extend and fasten members to supporting structure.
   2. Install shelves in each shelving unit at spacing indicated on Drawings.

3.4 ADJUSTING AND CLEANING

A. Verify that shelves and shelf-to-post connectors adjust easily and properly.

B. On completion of installation, clean exposed surfaces as recommended by manufacturer.

C. Touch up marred finishes or replace metal storage shelving that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal storage shelving manufacturer.

D. Replace metal storage shelving that has been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 56 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes steel column supported pre-fabricated steel canopy.

1.3 SYSTEM DESCRIPTION

A. General: Provide a complete, integrated set of walkway cover manufacturer's standard mutually dependent components and assemblies that form a canopy system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water. Include primary and secondary framing, metal roof panels, and accessories complying with requirements indicated.
   1. Provide canopy system of size and with spacings, slopes, and spans indicated.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design canopy.

B. Structural Performance: Provide canopy capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Design Loads: As indicated on Drawings.
   2. Live Loads: Include vertical loads induced by maintenance workers, materials, and equipment for roof live loads.
   3. Roof Snow Loads: As indicated.
   4. Deflection Limits: Engineer assemblies to withstand design loads with deflections no greater than the following:
      a. Purlins and Rafters: Vertical deflection of 1/240 of the span.
      b. Metal Roof Panels: Vertical deflection of 1/240 of the span.

C. Seismic Performance: Design and engineer canopy systems capable of withstanding the effects of earthquake motions determined according to North Carolina State Building Code.

D. Thermal Movements: Provide canopy that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. 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.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for canopy.
   1. Include plans, elevations, and at least 3/4-inch scale sections of typical members and other components. Show anchors, reinforcement, accessories, layout, and installation details.
      a. Installation Drawings: Signed, dated, and sealed by a registered architect or professional engineer licensed in jurisdiction in which the project is located.
      b. Show locations of electrical service connections.

C. Delegated-Design Submittal: Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation who is licensed in the state in which Project is located.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of canopy manufacturer for installation of units required for this Project.

B. Source Limitations: Obtain canopy components through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of canopy and are based on the specific types and models indicated. Refer to Division 01 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 DELIVERY AND HANDLING

A. Deliver canopy in protective covering and crating to protect components and surfaces against damage.

1.8 COORDINATION

A. Coordinate installation of anchorages for canopy. Furnish setting drawings, templates, and directions for installing anchorages and other items that are to be embedded in concrete. Deliver such items to Project site in time for installation.

B. Coordinate delivery time so walkway cover systems can be installed within 24 hours of receipt at Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide pre-fabricated steel canopy by SheltersDirect; www.sheltersdirect.com; Phone: 800.393.9400 or a comparable product by one of the following:

1. Austin Mohawk, Inc.; Website: www.austinmohawk.com.

2.2 CANOPY SYSTEM, GENERAL

A. All materials are new and without defects which would lessen quality of work

B. All materials will conform to the requirements, tolerances, etc. of the latest editions of the AISC Manual of Steel Construction, AISI Specifications for the Design of Cold Formed Steel Members, ASTM Standard Specifications for General Requirements for rolled steel plates, shapes, sheets, and bars for structural use, and AWS for welded connections.

C. Canopy erection drawings to be furnished at time of shipment. Piece marks included for field identification of all major parts.

D. Anchor bolt setting plans includes a required footing size.

E. All A325 bolts shall be tightened by the turn-of-nut method.

2.3 STRUCTURAL COMPONENTS

A. Columns:

1. Structural steel tubing shall be used.
2. Square tube to be ASTM A500 Grade B with a minimum yield stress of 46,000 psi.
3. Round tube to be ASTM A500 Grade B with a minimum yield stress of 42,000 psi.
4. Sized to meet or exceed specific project design load requirements.
5. Provide each column with a 4" electrical access opening and cover plate.

B. Base Plates:
   1. ASTM A36 structural steel plate with a minimum yield stress of 36,000 psi. Plate to be minimum 1" thick with welded gussets. Shop fabricated with pre-punched or pre-drilled bolt holes.

C. Top Plates:
   1. ASTM A36 structural steel plate with a minimum yield stress of 36,000 psi. Plate to be minimum ¾-inch thick with welded gussets. Shop fabricated with pre-punched or pre-drilled bolt holes.

D. Structural Framing:
   1. ASTM A36 wide flange steel beams shall be used.

E. Structural Connections:
   1. ASTM A36 structural steel connection plates with a minimum yield stress of 36,000 psi.
   2. All framing members shall be shop fabricated for bolted field assembly.
   3. Domestic ASTM A325 high strength bolts shall be used. All ASTM A325 Bolts shall be installed per the RSCS SPECIFICATION FOR STRUCTURAL JOINTS USING A325 OR A490 BOLTS, 11/13/85, contained in part 5 of the AISC MANUAL OF STEEL CONSTRUCTION, ALLOWABLE STRESS DESIGN, 9th EDITION.
   4. Flange and purlin bracing where required.

F. Anchor Bolts:
   1. ASTM A572 grade 50 threaded round stock with a minimum yield stress of 50,000 psi.
   2. 1-1/4 inches diameter x 36 inches long rod with a 90 degree, 6 inches minimum, bent leg shall be used. Total bolt length 42 inches.
   3. Threaded projection above footing shall be 7 inches.
   4. Double nuts and washers for each bolt shall be provided, one set to be used for plumbing and leveling.
   5. Templates for setting anchor bolts shall be provided.
   6. Templates shall be removed before setting column on foundation.

G. Painting:
   1. All framing members will be given one shop coat of drying red oxide primer.
   1. Finish Coat Color and Gloss: As selected by Architect.

2.4 DECK PANELS

A. ASTM A653 with a minimum yield stress of 40,000 psi having a G60 galvanized surface.

B. 20 gauge, 16 inches wide x 3 inches deep, steel panels.

C. Panels are fastened to the wide flange purlin beams with an engineered, screw type, clamp and lock nut system.

D. No splicing of deck panels will be allowed.

E. Panels shall have a finish side coated with a full coat of polyester paint baked on over an epoxy primer. A white wash coat applied over an epoxy primer shall protect reverse side.

F. Panels to be manufactured in sufficient length to avoid unnecessary center gutters.

2.5 FACIAS

A. Laminated Panels
   1. 24 gage sheet steel.
   2. Factory pre-assembled in 10 feet lengths.
   3. No exposed fasteners on bottom or exterior face.
   4. Panel core material: 1 inch thick virgin expanded polystyrene in 1.25 PCF density.
   5. Panels shall have a finish side coated with a fully coat of polyester paint baked on over an epoxy primer. A white polyester wash coat baked on over an epoxy primer shall protect reverse side of panel.
   6. Backer sheet of laminated panel to be G60 galvanized sheet metal.

B. Fascia Attachment Systems:
   1. Fascia support brackets to be 20 gage galvanized steel. Break to form channel 1-1/2 inches x 2 inches x 1-1/2 inches; 8 feet long.

2.6 ACCESSORIES
A. Gutter:
   1. Straight sections to be ASTM A653 with a minimum yield stress of 40,000 psi having a G60 galvanized surface.
   2. Straight sections are 8 feet wide x 3 inches deep, 20 gage steel.
   3. Straight gutter sections shall have a finish side coated with a full coat of polyester paint baked on over an epoxy primer. Interior surface shall be protected by a white wash coat baked on over an epoxy primer.
   4. Corners to be molded fiberglass with gel coat finish.
B. Downspouts:
   1. Collectors:
      a. Round, gel coated fiberglass.
   2. External Downspouts
      a. 4 inches x 3 inches, 26 gage, roll formed with watertight locked seams.
      b. Exterior painted with a full coat of white/bronze polyester paint baked on over an epoxy primer.
      c. Downspouts shall be of one continuous length up to 15 feet.
   3. Internal Drains
      a. 3 inches Schedule 40 PVC.
   4. Hardware:
      a. Gutter to deck panel fasteners shall be #14 x ¾-inch long, self-drilling, screws.
   5. Sealants:
      a. Tube sealant shall be 100% silicone and/or urethane caulk.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Verify all dimensions existing and provided.
B. Make reasonable adjustments in fabrication and erection to provide an acceptable finished walkway cover.

3.2 INSTALLATION
A. Excavation: In firm, undisturbed or compacted soil, excavate walkway cover systems foundation to dimensions indicated.
B. Set anchor bolts and other embedded items required for installation of canopy system. Use templates furnished by suppliers of items to be attached.
C. Install canopy system level, plumb, and at height and slope indicated, with surfaces free from distortion or other defects in appearance.
   1. Beams:
      a. If mechanically fastened system, place beams in column notches and secure with proper number of fasteners as specified by size of beam and engineering. Ensure contact bearing in bottom of column notches; insert shim plates as necessary.
      b. Level tops of beams to receive roof panels; roof panels shall drain rainwater into beams as indicated.
      c. Minor connections and incidental details shall be as shown on the drawings.
      d. Ensure that end caps are welded or mechanically fastened securely into place.

2. Hanger Rod: Attach hanger rod to imbedded anchor plate in accordance with approved shop drawings.
3. Roof Panels:
   a. Fabricate roof panels to required lengths.
   b. Install level and square to beams to avoid "out of square" conditions at beam ends.
   c. Secure each contact point with a minimum of three stainless steel fasteners with ¾-inch flat neoprene washers.
4. Joints Sealants and Flashing:
   a. Seal fabrication joints and seams away from view where required.
   b. Seal all other points where water penetration might be expected.
   c. Flash connection to walls where walkway cover units contact surface of building: do not use sealant.

3.3 CLEANING

A. At completion of installation, clean soiled surfaces of walkway cover systems according to manufacturer's written instructions.
   1. Remove protective film from members. Clean canopy of dirt, grease, handprints, and other blemishes. Leave area in a neat, clean, and acceptable condition.
B. Protect canopy from damage from other construction operations. Provide temporary barricades where necessary.

END OF SECTION 10 73 18

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes ground-set aluminum flagpoles.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to the following design criteria:
   1. Seismic and Wind Loads: As indicated on Drawings.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Delegated-Design Submittal: For flagpole assemblies indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Include loads, point reactions, and locations for attachment of flagpoles to building's structure.

C. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 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. American Flagpole; a Kearney-National Inc. company.
   2. The Baartol Company.
   3. Concord Industries.
   4. Ewing International Corporation.
   5. Morgan-Francis Flagpoles.
   6. PLP Composite Technologies, Inc.
   7. Pole-Tech Company, Inc.
   8. Superior Aluminum Products.
   9. U.S. Flag & Flagpole Supply.

2.2 FLAGPOLES

A. Aluminum Flagpoles: Provide cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.

B. Exposed Height: 30 feet, unless otherwise indicated.

C. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, not less than 0.064-inch- nominal wall thickness. Provide with 3/16-inch steel bottom plate and support plate; 3/4-inch- diameter, steel ground spike; and steel centering wedges welded together. Galvanize steel after assembly. Provide loose hardwood wedges at top of foundation tube for plumbing pole. Provide flashing collar of same material and finish as flagpole.

D. Cast-Metal Shoe Base: For anchor-bolt mounting; provide with anchor bolts.

E. Finial Ball: Manufacturer's standard flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter. Fabricate from 0.063-inch spun aluminum, finished to match flagpole.

F. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stainless-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Provide flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

G. Halyard Flag Snaps: Provide two swivel snap hooks per halyard.

2.3 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

B. Sand: ASTM C 33, fine aggregate.

C. Elastomeric Joint Sealants: Joint sealants complying with requirements in Division 07 Section "Joint Sealants."

2.4 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 FLAGPOLE INSTALLATION

A. General: Install flagpoles where shown and according to Shop Drawings and manufacturer's written instructions.

B. Ground Set: Place foundation tube, center, and brace to prevent displacement during concreting. Install flagpole, plumb, in foundation tube. Place tube seated on bottom plate between steel centering wedges and install hardwood wedges to secure flagpole in place. Place and compact

sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.

C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

D. Mounting Brackets and Bases: Anchor brackets and bases securely through to structural support with fasteners as indicated on approved Shop Drawings.

END OF SECTION 10 75 16

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes manually operated roller shades.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, relationship to adjoining Work, and details of installation, and operational clearances.

1. Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

C. Coordination Drawings: Drawn to scale and coordinating penetrations and ceiling-mounted items.

D. Samples: For each exposed finish and for each color and texture required.

E. Window Treatment Schedule: Use same room designations indicated on Drawings.

F. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer, approved by manufacturer to install manufacturer's products.

B. Roller Shades Fire-Test-Response Characteristics: Provide products passing flame-resistance testing according to NFPA 701 by a testing agency acceptable to authorities having jurisdiction.

C. Corded Window Covering Product Standard: Comply with WCMA A 100.1.

PART 2 - PRODUCTS

2.1 ROLLER SHADES

A. Basis of Design Product: The basis of design for roller shades is based on products selected by Architect from MechoShade Systems, Inc. Subject to compliance with requirements, provide selected product or an approved equal product by one of the following:

1. Draper, Inc.
2. Hunter Douglas, Inc.
3. Levolor Window Fashions; a Newell Rubbermaid Company.
4. Lutron Shading Solutions.

B. Shade Band Material: As scheduled or as selected by Architect.

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets.

D. Direction of Roll: Regular, from back of roller, and reverse, from front of roller.

E. Mounting Brackets: Fascia end caps, fabricated from steel finished to match fascia or headbox.

F. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; removable design for access.

G. Top/Back Cover: L-shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.

H. Shade Operation: Manual; with continuous loop bead chain, clutch, and cord tensioner and bracket lift operator.

1. Pull: Manufacturer's standard pole engaged pull.
   a. Pole: In length required making operation convenient from floor level, with hook for engaging ring.
2. Position of Clutch Operator: Left or Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated.
3. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
4. Loop Length: Length required to make operation convenient from floor level.
5. Bead Chain: Nickel-plated metal or Stainless steel.
6. Operating Function: Stop and hold shade at any position in ascending or descending travel.

I. Bottom Bar: Steel or extruded aluminum. Provide concealed, by pocket of shade material, internal-type.

J. Mounting: As indicated on Drawings, permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

2.2 FABRICATION

A. Product Description: Roller shade consisting of roller, a means of supporting roller, flexible sheet or band of material carried by roller, a means of attaching material to roller, bottom bar, and operating mechanism that lifts and lowers the shade.

B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
   1. Lifting Mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
   1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
   2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting roller, and operating hardware and for hardware position and shade mounting method indicated.

E. Installation Fasteners: Not fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions. Allow clearances for window operation hardware.
   1. Location: Shade band positioned not closer than 2 inches to interior face of glass.

B. Adjusting: Adjust roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Cleaning: Clean roller shade surfaces after installation, according to manufacturer's written instructions.

3.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems. Refer to Division 01 Section "Closeout Procedures Demonstration and Training."

END OF SECTION 12 24 13

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes countertops for custom cabinets.

B. Related Sections include:

1. Division 06 Section "Interior Architectural Woodwork" for cabinetry and related requirements.
2. Division 07 Section "Joint Sealants" for countertop joint sealants.

1.3 SUBMITTALS

A. Product Data: For each variety stone and manufactured products.

B. Shop Drawings: Include plans, sections, details, and attachments to other work. Combine with Shop Drawings of cabinets and casework specified in other Sections.

C. Samples for Verification: For each finish product specified, submit sample of minimum 6 inches square, representing actual product, color, and pattern.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of construction to receive countertops by field measurements before fabrication.

B. 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.

PART 2 - PRODUCTS

2.1 COMPOSITE STONE COUNTERTOPS

A. Composite Stone Material/Quartz Countertops: Quartz aggregate, resin, and color pigments formed into flat slabs with anti-microbial protection, integral to sheet.

1. Manufacturers: Subject to compliance with requirements, provide Corian Quartz or comparable products by one of the following:
   a. Caesarstone Quartz
   b. Cosentino; Silestone.
   c. Hanwha; HanStone.
   d. Wilsonart Cambria Quartz.
2. Stone Thickness: 3 cm.
3. Surface Finish: Polished.
4. Exposed Edge Treatment, Back and End Splashes: As indicated on Drawings.
5. Colors and Thickness: As indicated on Finish Schedule or as selected by Architect.

B. Plastic-Laminate Countertops: High-Pressure Decorative Laminate Grade: HGS or HGP as indicated.

1. Manufacturers: Subject to compliance with requirements, provide Wilsonart International as indicated in Finish Schedule, or comparable products by one of the following:
   a. Abet Laminati, Inc.
   b. Formica Corporation.
   c. Lamin-Art, Inc.

d. Panolam Industries International, Inc.
2. Products and Colors: As indicated on Finish Schedule or as selected by Architect.
3. Exposed Edge Treatment: Square, substrate built up to minimum 1-1/4 inches thickness, covered with matching plastic laminate.

2.2 ACCESSORY MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum ¾-inch thick; join lengths using metal splines.
B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
C. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.3 FABRICATION

A. Quartz Agglomerate Countertops:
1. Fabricate stone countertops in sizes and shapes required to comply with requirements indicated, including details on Drawings and approved Shop Drawings.
2. Fabricate stone tops and splashes in the largest sections practicable, with top surface of joints flush.
a. Join lengths of tops using best method recommended by manufacturer.
1) Grouted Joints: 1/16 inch in width, unless otherwise recommended.
2) Sealant-Filled Joints: 1/16 inch in width, unless otherwise recommended.
b. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
c. Finish exposed faces of stone to comply with requirements indicated. Provide matching finish on exposed edges of countertops, splashes, and cutouts. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
3. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
4. Cutouts and Holes:
a. Under counter Fixtures: Make cutouts for under counter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.
b. Counter-Mounted Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
c. Fittings: Drill countertops in shop for plumbing fittings and similar items.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 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.

3.3 INSTALLATION OF COUNTERTOPS

A. General: Anchor securely using concealed fasteners through corner blocks of base cabinets or other supports into underside of countertop. Make flat surfaces level; shim where required.

B. Set stone countertops to comply with requirements indicated on Drawings and approved Shop Drawings. Shim and adjust stone to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships.

C. Plastic Laminate Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop with minimum penetration into substrate boards of 5/8-inch.

D. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Use power saws with diamond blades to cut stone. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

E. Install backsplash and end splash by adhering to wall with water-cleanable epoxy adhesive. Leave 1/16-inch gap between countertop and splash for filling with sealant. Use temporary shims to ensure uniform spacing.

F. Grout joints to comply with ANSI A108.10. Remove temporary shims before grouting. Tool grout uniformly and smoothly with plastic tool.

G. Apply sealant to gaps specified for filling with sealant; comply with Division 7 Section "Joint Sealants." Remove temporary shims before applying sealant.

3.4 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.

B. Clean stone countertops not less than six days after completion of installation, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone.

C. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 12 36 00

SECTION 13 34 19

METAL BUILDING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal Building System:
   1. Structural steel framing system.
   2. Metal roof system.
   3. Metal wall system.
   4. Roof and wall insulation systems.

1.2 RELATED REQUIREMENTS

A. Section 03 10 00 Concrete Formwork

1.3 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC):
   1. AISC 360 - Specification for Structural Steel Buildings.
   2. AISC Design Guide 3 – Serviceability for Steel Buildings

B. ASTM International (ASTM):
   1. ASTM A 325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
   2. ASTM A 653 / A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   3. ASTM A 792 / A 792M – Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
   4. ASTM C 1363 – Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
   5. ASTM D 1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
   6. ASTM D 2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
   7. ASTM D 2247 – Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
   8. ASTM D 4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
   9. ASTM E 96 / E 96M – Standard Test Methods for Water Vapor Transmission of Materials.
   10. ASTM E 1592 – Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.

11. ASTM G 87 – Standard Practice for Conducting Moist SO2 Tests.

C. Metal Building Manufacturers Association (MBMA):
   1. MBMA Metal Building Systems Manual.
   2. Seismic Design Guide for Metal Building Systems.

D. North American Insulation Manufacturers Association (NAIMA):
   1. NAIMA 202 – Standard For Flexible Fiber Glass Insulation to be Laminated for Use in Metal Buildings.

E. The Society for Protective Coatings (SSPC):
   1. SSPC-Paint 15 - Primer for Use Over Hand Cleaned Steel performs to SSPC-Paint 15 standards.
   2. SSPC-SP2 – Hand Tool Cleaning.

F. Underwriters Laboratories (UL):
   1. UL 580 – Standard for Tests for Uplift Resistance of Roof Assemblies.
   2. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.

1.4 PREINSTALLATION MEETINGS

A. Convene preinstallation meeting 2 weeks before start of installation of metal building system.

B. Require attendance of parties directly affecting work of this section, including Contractor, Architect, Engineer, installer, and metal building system manufacturer's representative.

C. Review materials, installation, protection, and coordination with other work.

1.5 SUBMITTALS

A. Comply with Section 01 33 00 – Submittal Procedures.

B. Product Data: Submit metal building system manufacturer's product information, specifications, and installation instructions for building components and accessories.

C. Erection Drawings: Submit metal building system manufacturer's erection drawings, including plans, elevations, sections, and details, indicating roof framing, transverse cross-sections, covering and trim details, and accessory installation details to clearly indicate proper assembly of building components.

D. Certification: Submit written "Certificate of design and manufacturing conformance" prepared and signed by a Professional Engineer, registered to practice in North Carolina verifying that the metal building system design and metal roof system design (including panels, clips, and support system components) meet indicated loading requirements and codes of authorities having jurisdiction.
   1. Certification shall reference specific dead loads, live loads, snow loads, wind loads/speeds, tributary area load reductions (if applicable), concentrated loads, collateral loads, seismic loads, end-use categories, governing code bodies, including year, and load applications.

2. Submit certification 1 week before bid date on the metal building system manufacturer's letterhead.

E. Submit certification verifying that the metal roof system has been tested and approved by Underwriter's Laboratory as Class 90.

F. Submit certification verifying that the metal standing seam roof system has been tested in accordance with ASTM E 1592 test protocols.

G. Warranty Documentation: Submit manufacturer's standard warranty.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. Manufacturer regularly engaged, for past 10 years, in manufacture of metal building systems of similar type to that specified.
   2. Accredited based on IAS Accreditation Criteria AC472 and requirements in International Building Code (IBC), Chapter 17.

B. Installer's Qualifications:
   1. Installer regularly engaged, for past 5 years, in installation of metal building systems of similar type to that specified.
   2. Employ persons trained for installation of metal building systems.

C. Certificate of design and manufacturing conformance:
   1. Metal building system manufacturer shall submit written certification prepared and signed by a Professional Engineer, registered to practice in North Carolina verifying that building system design and metal roof system design (including panels, clips, and support system components) meet indicated loading requirements and codes of authorities having jurisdiction.
   2. Certification shall reference specific dead loads, live loads, snow loads, wind loads/speeds, tributary area load reductions (if applicable), concentrated loads, collateral loads, seismic loads, end-use categories, governing code bodies, including year, and load applications.
   3. Certificate shall be on metal building system manufacturer's letterhead.
   4. Refer to Submittals article of this specification section.

D. Material Testing:
   1. In addition to material certifications of structural steel, metal building system manufacturer shall provide, upon request at time of order, evidence of compliance with specifications through testing.
   2. This quality assurance testing shall include testing of structural bolts, nuts, screw fasteners, mastics, and metal coatings (primers, metallic coated products, and painted coil products).

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling Requirements:
   1. Store and handle materials in accordance with manufacturer's instructions.
   2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
   3. Do not store materials directly on ground.
   4. Store materials on flat, level surface, raised above ground, with adequate support to prevent sagging.
   5. Protect materials and finish during storage, handling, and installation to prevent damage.

1.8 WARRANTY

Specifier Notes: Specify any one of the **three** paragraphs below for generic structural standing-seam roof systems. Specify the **third** paragraph when specifying through-fastened roof systems.

A. Metal building system manufacturer shall provide a written weathertightness warranty for a maximum of 20 years against leaks in standing roof panels, arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions.
   1. Warranty shall be signed by both the metal roof system manufacturer and the metal roof system installer.

B. Metal building system manufacturer shall provide a written warranty for 25 years against perforation of metal roof panels due to corrosion under normal weather and atmospheric conditions.
   1. Warranty shall be signed by metal roof system manufacturer.

C. Metal building system manufacturer shall provide a paint film written warranty for 25 years against cracking, peeling, chalking, and fading of exterior coating on painted roof and wall panels.
   1. Warranty shall be signed by metal building system or roof system manufacturer and state that the coating contains 70 percent "Kynar 500" or "Hylar 5000" resin.
   2. Metal building system manufacturer shall warrant that the coating shall not peel, crack, or chip for 25 years.
   3. For a period of 25 years, chalking shall not exceed ASTM D 4214, #8 rating and shall not fade more than 5 color difference units in accordance with ASTM D 2244.

PART 2 PRODUCTS

2.1 BUILDING DESCRIPTION

A. Building Dimensions: Indicated on the Drawings.
   1. Horizontal Dimensions: Measure to inside face of wall sheets.
   2. Eave Height: Measure from top of finished floor to intersection of insides of roof and sidewall sheets.
   3. Clear Height Between Finished Floor and Bottom of Roof Beams: Indicated on the Drawings.

B. Primary Structural Members:
   1. As shown and described on the structural drawings.

C. Metal Roof System: Standing seam roof as described and shown on the architectural drawings

D. Metal Wall System: Metal wall panels are as shown with material and direction of installation on the architectural drawings.

2.2 METAL ROOF SYSTEM

A. Metal Roof System: Standing seam roof system.

B. Roof System Design:
   1. Design roof panels and liner panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
   2. Design roof paneling system to support design live, snow, and wind loads.
   3. Endwall Trim and Roof Transition Flashings: Allow roof panels to move relative to wall panels and/or parapets as roof expands and contracts with temperature changes.

C. Roof System Performance Testing:
   1. UL Wind Uplift Classification Rating, UL 580: Class 90.
   2. Structural Performance Under Uniform Static Air Pressure Difference: Test roof system in accordance with ASTM E 1592.

D. Roof Panels:
   1. Factory roll-formed, 24 inches wide, with 2 major corrugations, 2 inches high (2-3/4 inches including seam), 24 inches on center.
   2. Flat of the Panel: Cross flutes 6 inches on center, perpendicular to major corrugations in entire length of panel to reduce wind noise.
   3. Variable Width Panels:
      a. For roof lengths not evenly divisible by the 2’-0” panel width, factory-manufactured variable-width (9-inch, 12-inch, 15-inch, 18-inch, and 21-inch-wide) panels shall be used to ensure modular, weathertight roof installation.
      b. Minimum Length: 15 feet.
      c. Supply maximum possible panel lengths.

Specifier Notes: Specify **one** of the following **three** Panel Material and Finish paragraphs. Delete Panel Material and Finish paragraphs not specified.

4. Panel Material and Finish:
   a. 24-gauge galvanized steel, G90 coating; ASTM A 653, G90.
   b. Paint with exterior colors of finish system, full-strength, 70 percent "Kynar 500" or "Hylar 5000" fluoropolymer (PVDF) coating.
   c. PVDF Coating Warranty: Metal building system manufacturer shall warrant coating for 25 years for the following.
      1) Not to peel, crack, or chip.
      2) Chalking: Not to exceed ASTM D 4214, #8 rating.
      3) Fading: Not more than 5 color-difference units, ASTM D 2244.
5. Use panels of maximum possible lengths to minimize end laps.
6. Extend eave panels beyond structural line of sidewalls.
7. Factory punch panels at panel end to match factory-punched holes in eave structural member.
8. Panel End Splices: Factory punched and factory notched.
9. Panel End Laps: Locate directly over, but not fastened to, a supporting secondary roof structural member and be staggered, to avoid 4-panel lap-splice condition.
10. End Laps: Floating. Allows roof panels to expand and contract with roof panel temperature changes.
11. Self-Drilling Fasteners: Not permitted in weathering membrane of roof system.
12. Ridge Assembly:
    a. Design ridge assembly to allow roof panels to move lengthwise with expansion and contraction as roof panel temperature changes.
    b. Factory punch parts for correct field assembly.
    c. Install panel closures and interior reinforcing straps to seal panel ends at ridge.
    d. Do not expose attachment fasteners on weather side.
    e. Use lock seam plug to seal lock seam portion of panel.
    f. High-Tensile Steel Ridge Cover: Span from panel closure to panel closure and flex as roof system expands and contracts.

E. Insulation Board:
   1. Rigid Metal Building Board glass-fiber-reinforced, polyisocyanurate foam plastic core.
   2. Width: 4 feet.
   3. Maintain Class A fire rating.
   4. Approved for use without thermal barrier.
   5. Maximum Thickness: 4 inches.
   6. Covered with embossed aluminum facing - Metal Building Board.

F. Vapor Retarder:
   1. WMP-50, 0.0015-inch minimum thickness, UV-stabilized, white polypropylene, laminated to 30-pound Kraft paper / metalized polyester and reinforced with glass fiber and polyester scrim.
   2. Perm Rating: 0.02.

G. Interior Liner Panels:
   1. Form panels from 0.0149 - inch minimum total coated thickness coated steel with minimum yield strength of 80,000 psi.
   2. Painted Panel Finish:
      a. Exposed Side: 0.15-mil min primer and 0.70-mil minimum interior white polyester paint.
      b. Unexposed Side: 0.1-mil minimum primer and 0.40 minimum polyester backer
      c. Panel Dimensions: Nominal 36 inches wide with corrugations 1/2 inches high, 3 inches on center.
   3. Factory cut panels to lengths required.

H. Provision for Expansion and Contraction:
   1. Provision for Thermal Expansion Movement of Roof Panels: Clips with movable tab.
      a. Stainless Steel Tabs: Factory centered on roof clip to ensure full movement in either direction.
      b. Maximum Force of 8 Pounds: Required to initiate tab movement.
      c. Each Clip: Accommodates a minimum of 1.25-inch movement in either direction.
   2. Roof: Provide for thermal expansion and contraction without detrimental effects on roof panels, with plus or minus 100-degree F temperature difference between interior structural framework of building and of roof panels.

I. Fasteners:
   1. Make connections of roof panels to structural members, except at eaves, with clips with movable stainless steel tabs, seamed into standing seam side lap.
   2. Fasten insulation board, bearing plates, and panel clips to structural members with fasteners in accordance with erection drawings furnished by metal building system manufacturer, using factory-punched or field-drilled holes in structural members.
      a. Fasteners: Metal-backed rubber washer to serve as torque indicator.
   3. Fasteners penetrating metal membrane at the following locations do not exceed the frequency listed:
      a. Basic Panel System: 0 per square foot.
      b. High Eave Trim, No Parapet: 2 per linear foot.
      c. Exterior Eave Gutter: 2 per linear foot.
      d. Panel Splices: 2 per linear foot.
      e. Gable Trim: 0 per linear foot.
      f. High Eave with Parapet: 0 per linear foot.
      g. Ridge: 0 per linear foot.
      h. Low Eave Structural: 1.5 per linear foot.

J. Accessories:
   1. Accessories (i.e., ventilators, skylights, gutters, fascia): Standard with metal building system manufacturer, unless otherwise noted and furnished as specified.
   2. Metal Coating on Gutters, Downspouts, Gable Trim, and Eave Trim: finish system, full-strength, 70 percent "Kynar 500" or "Hylar 5000" fluoropolymer (PVDF) coating.
   3. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.

4. Material used in flashing and transition parts and furnished as standard by metal building system manufacturer may or may not match roof panel material.
    a. Parts: Compatible and not cause corrosive condition.
    b. Copper and Lead Materials: Do not use with Galvalume or optional aluminum-coated panels.

K. Thermal Performance:
1. Determine thermal performance in accordance with ASTM C 1363 and test U-factors for composite roof section.
2. Insulation Thicknesses: Maximum 4 inches.
3. Metal Building Board Insulation:
    a. Class I Factory Mutual Approval and UL Fire Hazard Classification Ratings, UL 723:
        1) Flame Spread: 25 or less.

2.3 METAL WALL SYSTEM

A. Exterior Metal Wall System: Per the architectural drawings.

B. Wall System Design: Design wall panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.

C. Wall Panels:
1. One piece from base to building eave.
2. Upper End of Panels: Fabricate with mitered cut to match corrugations of roof panels of 1/2 inch to 12 inches and square cut for all other roof panels and slopes.
3. Factory punch or field drill wall panels at panel ends and match factory-punched or field-drilled holes in structural members for proper alignment.
4. Panel Material and Finish:
    a. 26-gauge or 24-gauge painted Galvalume aluminum-zinc alloy (approximately 55 percent aluminum, 45 percent zinc), ASTM A 792.
    b. Paint with exterior colors of finish system, full-strength, 70 percent "Kynar 500" or "Hylar 5000" fluoropolymer (PVDF) coating.
    c. PVDF Coating Warranty: Metal building system manufacturer shall warrant coating for 25 years for the following.
        1) Not to peel, crack, or chip.
        2) Chalking: Not to exceed ASTM D 4214, #8 rating.
        3) Fading: Not more than 5 color-difference units, ASTM D 2244.
5. Panel Material and Finish: Special materials, gauges, or colors as applicable for custom designs.

D. Fasteners:
1. Fastener Locations: Indicated on erection drawings furnished by metal building system manufacturer.
2. Exposed Fasteners: Factory painted to match wall color.

E. Accessories:
1. Accessories (i.e., doors, windows, louvers): Standard with metal building system manufacturer, unless otherwise noted and furnished as specified.

2. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.

2.4 INSULATION

A. Laminated Fiberglass: Owens-Corning Fiberglas, NAIMA 202, "Certified R" metal building insulation.
   1. TIMA Insignia and Insulation Thickness: Ink-jet printed on fiberglass.

B. Back-Fill Insulation: Owens-Corning Fiberglas unfaced "Pink Metal Building Insulation Plus".

C. Roof and Wall Insulation Facing: R-3035 HD (FSK-HD) (Silver).
   1. 0.0003-inch-thick, aluminum foil laminated to 30-pound Kraft paper, reinforced with glass-fiber scrim, in unpainted (Aluminum Adhere facing to Owens-Corning Fiberglas "Certified R", NAIMA 202, fiberglass blanket
   2. Assembly of Insulation Blanket and Facing:
      a. Flame Spread Rating: Less than 25.
      b. UL Label: Submit as specified in Submittals article of this section.
      c. Facing Perm Rating: 0.02.

D. Roof and Wall Insulation Facing: PSK Light Duty (WMP-VR).
   1. 0.0015-inch-thick, UV-stabilized, white polypropylene laminated to 11-pound Kraft paper, reinforced with glass-fiber scrim, in white.
   2. Adhere facing to Owens-Corning Fiberglas "Certified R", NAIMA 202, fiberglass blanket.
   3. Assembly of Insulation Blanket and Facing:
      a. Flame Spread Rating: Less than 25.
      b. UL Label: Submit as specified in Submittals article of this section.
      c. Perm Rating: 0.09.
   4. 0.0015-inch-thick, UV-stabilized, white polypropylene laminated to metalized polyester film, reinforced with glass-fiber scrim.
   5. Adhere facing to Owens-Corning Fiberglas "Certified R", NAIMA 202, fiberglass blanket.
   6. Assembly of Insulation Blanket and Facing:
      a. Flame Spread Rating: Less than 25.
      b. UL Label: Submit as specified in Submittals article of this section.
      c. Perm Rating: 0.02.

E. Roof and Wall Insulation Facing:
   1. 0.0015-inch-thick, UV-stabilized, white polypropylene film laminated to 30-pound Kraft paper/metalized polyester, reinforced with glass-fiber and polyester scrim.
   2. Adhere facing to Owens-Corning Fiberglas "Certified R", NAIMA 202, fiberglass blanket.
   3. Assembly of Insulation Blanket and Facing:
      a. Flame Spread Rating: Less than 25.
      b. UL Label: Submit as specified in Submittals article of this section.
      c. Perm Rating: 0.02.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine area to receive metal building system.

B. Notify Architect of conditions that would adversely affect installation or subsequent use.

C. Do not begin installation until unacceptable conditions are corrected.

3.2 ERECTION – STRUCTURAL STEEL FRAMING SYSTEM

A. Erect structural steel framing system in accordance with the Drawings and metal building system manufacturer's erection drawings.

B. Field Modifications:
   1. Require approval of metal building system manufacturer.
   2. Responsibility of building erector.
   3. Field Modifications to Truss Purlins: Not allowed, unless indicated on erection drawings furnished by metal building system manufacturer.

C. Fixed Column Bases: Grout flush with floor line after structural steel erection is complete.

3.3 PROTECTION

A. Protect installed metal building system to ensure that, except for normal weathering, metal building system will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 13 34 19