Project Manual for

Clemson University
Bryan Mall High Rises Renovation

Manning Hall – GMP 8

Clemson, South Carolina

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State Permanent Improvement Project
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CONSTRUCTION DOCUMENTS

VOLUME 1 OF 2

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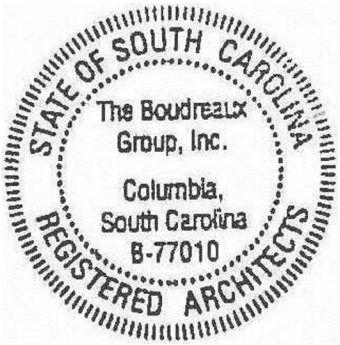

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SECTION 00 10 70 - SPECIAL CONDITIONS

PART 1 – GENERAL

1.1 OWNER, ARCHITECT, CONSTRUCTION MANAGER AT RISK (CM@R), CONTRACTORS AND SUBCONTRACTORS DEFINED

A. Refer to specification section 011000 Summary for listing of parties and for definition of roles in the performance of work.

1.2 JOB SIGN

A. The CM@R shall provide a job sign in accordance with Clemson University's requirements.

1.2 PERSONS AUTHORIZED TO SIGN DOCUMENTS

A. The CM@R's list of persons in the firm who are authorized to sign documents such as contracts, certificates, and affidavits on behalf of the firm is on file with Clemson University.

1.3 APPROVAL, BY ARCHITECT, OF SUBSTITUTE MATERIALS AND EQUIPMENT

A. Approval, by the Architect, of substitute materials and equipment shall not relieve the Contractor from his responsibility to supply and install any additional materials, equipment, or labor required to make the substitution properly function within the intent of the contract documents, as issued for Bid, whether or not such additional materials, equipment or labor are shown on the data submitted with the request for approval and whether or not recognized by the Architect or Contractor. The Contractor shall supply and install such required additional material, equipment or labor solely at his own expense and at no additional cost to the Owner.

1.4 PRE-CONSTRUCTION CONFERENCE

A. CM@R will administer pre-construction conferences for execution of scheduling and construction coordination items relating to Owner-CM@R agreement and exchange of submittals. The pre-construction conference will be held at the project prior to commencement of work. CM@R to provide a full list of subcontractors at this time.

1.5 PROGRESS MEETINGS

A. The CM@R shall schedule and administer project meetings throughout progress of the work.

B. The CM@R shall make physical arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within two days to Architect, participants, and those affected by decisions made at meetings.

C. Attendance: Project Manager, Project Superintendent, Owner and Architect and major Subcontractors and Supplier as is appropriate to agenda topics for each meeting.

D. Suggested Agenda: Review of work progress, status of progress schedule and adjustments thereto, delivery schedules, submittals, maintenance of quality standards, pending changes and substitutions,

and other items affecting progress of work.

1.6 PREINSTALLATION CONFERENCES

A. When required in individual specification Section, the CM@R will convene a preinstallation conference prior to subcontractors commencing work of the Section.

B. Require attendance of entities directly affecting, or affected by, work of the Section.

C. Review conditions of installation, preparation and installation procedures, and coordination with related work.

1.7 PRODUCT DATA

A. Product data shall be submitted in accordance with CM@R's digital submittal requirements outlined in the Subcontractor RFP.

B. Submit only pages that are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.

C. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable to the work.

D. All submittals shall be electronic and shall be submitted through the CM@R's construction management software. Hard copies are NOT required and will not be accepted.

1.8 SAMPLES

A. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified for custom finishes, indicating colors, textures, and patterns, for Architect selection. The Architect will coordinate colors of finish materials. When requested by the Architect, submit finish samples for related work necessary to the coordination of colors. Review of approval of any finish will commence only upon receipt of requested related finishes.

B. Submit samples to illustrate functional characteristics of products including parts and attachments. Submit number of samples required by individual specification section.

C. Label each sample with identification required for transmittal letter. Submit sample with a transmittal letter. Identify project by title and number; identify contract by number. Identify work and product by specifications section and article number.

D. Submit the number of copies of each sample necessary to allow 1) one to be retained by the Architect, 2) one to be returned by the Architect 3) one for each consultant that needs to review the sample including one for the architectural consulting firm (in addition to the one provide to the lead Architect) and 4) one to be retained by the CM@R while other copies are in the A/E's possession.

E. Do not fabricate products or begin work that requires submittals until the return of submittal with

Architect acceptance is received.

1.9 MANUFACTURER'S INSTRUCTIONS

A. Manufacturer’s instructions shall be submitted in accordance with CM@R’s digital submittal requirements outlined in the Subcontractor RFP.

B. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Architect before proceeding.

C. All submittals shall be electronic and shall be submitted through the CM@R’s construction management software. Hard copies are not required and will not be accepted.

1.10 MANUFACTURER'S CERTIFICATES

A. Manufacturer’s Certificates shall be submitted in accordance with CM@R’s digital submittal requirements outlined in the Subcontractor RFP.

B. When required by individual specifications section, submit manufacturer's certificate that products meet or exceed specified requirements. Contractors are solely responsible for securing manufacturer's certificates. Inability to provide certification shall be grounds for rejection of the product. Contractors shall provide a certifiable substitute at no additional cost to the Owner.

C. All submittals shall be electronic and shall be submitted through the CM@R’s construction management software

D. Original hard copies shall be provided with project closeout.

1.11 RECEIVING MATERIALS FURNISHED BY OTHERS

A. Whenever Contractor or any Subcontractor shall receive items from another Contractor or from Owner for storage, erection or installation, Contractor or Subcontractor receiving such items shall give receipts for items delivered, and thereafter will be held responsible for care, storage, and any necessary replacing item or items received. No adjustment will be made to contract price for increased insurance premiums, except for materials and/or equipment furnished by Owner and not listed as such in other Contract Documents.

1.12 MANUFACTURERS' FIELD SERVICES

A. When specified in respective specification sections, require manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, and to make appropriate recommendations. Representative shall submit written report to Architect listing observations and recommendations.

1.13 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

D. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

1.14 CONSTRUCTION SET OF DRAWINGS AND PROJECT MANUAL

A. The Architect/Engineer will incorporate all Addendum items into the Drawings and Project Manual to produce a Construction Set of Drawings and Project Manual with all revisions clearly identified, including the Addendum under which the revisions were made. These Construction Sets and any re-issuance of drawings during construction are to be used by the CM@R, Contractors, and Subcontractors as the official field and office sets and for the completion of as-built drawings.

1.15 PACKAGING, TRANSPORTATION

A. Require supplier to package products in boxes or crates for protection during shipment, handling and storage. Protect sensitive products against exposure to elements and moisture. Protect sensitive equipment and finishes against impact, abrasion and other damage.

1.16 DELIVERY AND RECEIVING

A. Arrange deliveries of products in accordance with construction progress schedules. Allow time for inspection prior to installation. All subcontractors are responsible for receiving, handling and storing their own materials.

B. Coordinate deliveries with CM@R to avoid conflict with work and conditions at site; work of other Contractors, or Owner; limitations on storage space; availability of personnel and handling equipment; and Owner's use of premises.

C. Deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.

D. Clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.

E. Immediately on delivery, inspect shipment to assure:

1. Product complies with requirements of Contract Documents and requirements of Contract.
2. Quantities are correct.
3. Accessories and installation hardware are correct.
4. Containers and packages are intact and labels legible.
5. Products are protected and undamaged.

1.17 PRODUCT HANDLING

A. Provide equipment and personnel to handle products, including those provided by Owner, by methods to prevent soiling and damage.

B. Provide additional protection during handling to prevent marring and otherwise damaging products, packaging and surrounding surfaces.

C. Handle product by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.

1.18 REPORT OF GEOTECHNICAL EXPLORATION

A. The information on subsurface soil and groundwater conditions and recommendations for the design of foundations, floor slabs and associated project elements at the site with a geotechnical exploration is attached to this section for review and for information for the CM@R. Refer to the following attachments:

1. Bunnell Lammons Engineering, Report of Geotechnical Exploration, Bryan Mall Additions, Clemson University, Clemson, South Carolina, BLE Project Number J22-18069-01 dated August 2, 2022.

a) Addendum to Report of Geotechnical Exploration date January 26, 2023.

B. The General Contractor shall notify Owner/Architect if conditions appear to be different at various locations within the project limits. The Owner will hire a soil testing company during construction to assure that foundation, pavement and earthwork requirements are being met. Site preparation requirements to achieve necessary soil conditions are stipulated on Civil and Structural documents.

1.19 HAZARDOUS MATERIALS

A. Hazardous materials exist in the building. Refer to Clemson's Hazardous Material Abatement Design prepared by S&ME and included within this set of construction documents for the CM@R's convenience.

1. This component of the design was NOT performed by BOUDREAUX or BOUDREAUX's consultants. BOUDREAUX's professional liability does not cover the abatement of hazardous materials as is typical in the Architectural / Engineering industry and as such BOUDREAUX has no legal responsibility for the contents of these referenced abatement design documents below.

2. Refer to S&ME's cover letter to Clemson which references a hazardous material design and associated drawings for the removal, transportation and disposal of asbestos containing materials, lead materials, mercury sources and polychlorinated biphenyl sources.

a) Refer to and the attached referenced specification Section 028233 – Removal and Disposal of Asbestos Containing Materials provided by S&ME.

b) Refer to the following drawings in included in the drawing set provided by S&ME.

T1.00 Title Sheet
H0.01 Hazardous Materials Removal and Disposal Notes
H1.01 Hazardous Materials Removal and Disposal Ground Floor
H1.02 Hazardous Materials Removal and Disposal First Floor
H1.03 Hazardous Materials Removal and Disposal 2nd Through 10th Floors – Typical
H1.04 Hazardous Materials Removal and Disposal Penthouse and Roof

B. Abatement and Demolition and all other subcontractor must notify the CM@R and the University Project Manager assigned to the project immediately upon the discovery of additional materials suspected of being hazardous, such as those potentially containing asbestos or other hazardous materials. These materials are not to be disturbed until the University's hazardous material testing company has had the opportunity to test such materials in question and until the University Project Manager determined they are not hazardous and can be removed by the CM@R or one of their non abatement subcontractors.

1.20 REQUEST FOR ELECTRONIC FILES

A. Upon signing the attached Electronic Files Agreement and returning it the Architect, the CM@R, the subcontractors, and the subcontractors at every tier, shall have full access to utilize electronic files provided by the Architect for use related to the construction of this project.

1.21 PERMITS AND FEES

A. The State Engineers Office will issue the Building Permit. There will not be a cost to the Contractor.

END OF SECTION 00 10 70 (3 Attachments)

The Boudreaux Group

1519 Sumter Street (29201)
Post Office Box 5695
Columbia, South Carolina 29250
Phone: 799-0247

ELECTRONIC FILES AGREEMENT

DATE:

RECIPIENT-Name:_____

Address:_____

E-mail address: _____

PROJECT: **Clemson University – Bryan Mall High Rises Renovation**

The Boudreaux group and its consultants have agreed to provide construction documents related to the above referenced project to the Construction Manager at Risk (Juneau Construction Company) and its subcontractors, and sub-subcontractors of every tier, and vendors and suppliers in electronic/digital format. By signing this agreement and returning it, the Architect, the Construction Manager at Risk, its subcontractors, and sub-subcontractors and vendors and suppliers are agreeing to the terms indicated herein. All parties who are provided with electronic/digital format are required to sign this agreement. all parties who share these files with lower tier subcontractors, vendors or suppliers will in turn require its subcontractors, suppliers and vendors to agree to the same terms indicated herein.

The Boudreaux Group and it's consultants as author of the original electronic files have prepared the files for sole use as a bid document and to perform services for, and construction of, the above referenced project. Any use of this file, either all or in-part, for other than its initial use as a bid document and to perform services for, and construction of, the above referenced project shall be full and sufficient cause to hold the Boudreaux Group and it's consultants as author of the original electronic file harmless against any claim or liability resulting from any discrepancy, error or omission in the file's original or modified form.

Additionally, pdf copies of the documents are the official record of the design illustrated in drawing form. The Boudreaux Group and it's consultants as author of the original electronic files are not responsible for discrepancies between the pdf's and what may come across electronically in both its original Revit form and in any electronic translations of that form, such as AutoCad files. Also, it should be noted that since the high rise buildings have multiple typical levels, not all levels have been modeled to reflect the renovation design and electronic versions of such levels which do not match the pdf's should not be used.

AKNOWLEDGED
AND SIGNED BY: _____

REPORT OF GEOTECHNICAL EXPLORATION

BRYAN MALL ADDITIONS
CLEMSON UNIVERSITY
CLEMSON, SOUTH CAROLINA

Prepared For:
Bourdeaux
1519 Sumter Street
Columbia, South Carolina 29201

BLE Project Number J22-18069-01

August 2, 2022

BUNNELL LAMMONS ENGINEERING
6004 Ponders Court | Greenville, SC 29615
864.288.1265 864.288.4330 info@blecorp.com
BLECORP.COM

August 2, 2022

Boudreaux
1519 Sumter Street
Columbia, South Carolina 29201

Attention: Mr. Randall Huth, AIA

Subject: **Report of Geotechnical Exploration**
Bryan Mall Additions
Clemson University
Clemson, South Carolina
BLE Project No. J22-18069-01

Dear Mr. Huth:

Bunnell-Lammons Engineering, Incorporated (BLE) is pleased to present this report of geotechnical exploration for the proposed Bryan Mall additions at Clemson University in Clemson, South Carolina. This exploration was performed generally as described in Bunnell-Lammons Engineering (BLE) Proposal No. P22-1031 dated May 31, 2022. The exploration was authorized on June 8, 2022 by the signature of Mr. Huth on our Proposal Acceptance Sheet.

Sincerely,

BUNNELL-LAMMONS ENGINEERING, INC.

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER 8/2/22 NO. 34614 JASON C. JANSANTE

Jason C. Jansante, P.E.
Project Engineer
Registered, South Carolina #34614

William A. Mathews, P.E.
Chief Engineer
Registered, South Carolina #14039

SOUTH CAROLINA BUNNELL-LAMMONS ENGINEERING, INC. No. C01452 CERTIFICATE OF AUTHORIZATION

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Appendix

1.0 AUTHORIZATION

A geotechnical exploration for the proposed Bryan Mall additions on the Clemson University campus in Clemson, South Carolina was performed generally as described in Bunnell-Lammons Engineering (BLE) Proposal No. P22-1031 dated May 31, 2022. The exploration was authorized on June 8, 2022 by the signature of Mr. Huth on our Proposal Acceptance Sheet.

2.0 SCOPE OF EXPLORATION

This report details the findings of the geotechnical exploration performed for the Bryan Mall Additions on the Clemson University campus (reference Figure 1 in Appendix A). The intent of this exploration was to evaluate the subsurface soil and groundwater conditions at the site and provide geotechnical recommendations for design of the foundations, floor slabs and associated project elements. We have also included a discussion of secondary design considerations and provided geotechnical related construction recommendations.

3.0 PROJECT INFORMATION

The following project information was provided in a request for proposal (RFP) from Mr. Huth to our Mr. Jimmy Ladd. Included with the RFP were architectural plans of the proposed development, foundation information for the existing buildings and proposed structural loading information.

It is proposed to construct additions to Lever Hall, Manning Hall, and Byrnes Hall (also known as Bryan Mall) on the Clemson University campus. The additions will consist of additional bedrooms at three corners of the buildings and a new stairwell at one corner of the buildings. The additions will match the height of the existing structures (eleven stories). Based on the information provided, Byrnes Hall and Manning Hall are supported by 40-ton piles and Lever Hall is supported by shallow foundations with an allowable bearing capacity of 4,000 psf. We assume that the additions will be supported by deep foundations. The expansion areas consist of maintained grass with decorative trees or concrete sidewalks.

Based on the information provided by Mr. Mark Irving, P.E., with MMSA, Inc, the maximum static column load for the additions is 250 kips. However, we anticipate seismic and wind loading will dictate foundation design. Final grading information was not available at this time. However, we assume minimal (less than 5 feet) of earthwork cut and fill will be required for construction.

4.0 FIELD EXPLORATION

The site was explored by drilling twelve soil test borings (ASTM D1586) at the approximate locations shown on the attached Boring Location Plan (reference Figure 2 in Appendix A). Boring Logs are presented in Appendix C. The borings were located in the field by our Mr. Jason Jansante by referencing the provided site plan and identifiable site landmarks. The boring locations shown in Appendix A should be considered approximate. A description of our field procedures is also included as Appendix B.

5.0 SITE GEOLOGY

The project site is located in the Piedmont Physiographic Province, an area underlain by ancient igneous and metamorphic rocks. The virgin soils encountered in this area are the residual product of in-place chemical weathering of the rock. In areas not altered by erosion, previous construction or other human activities, the typical residual soil profile consists of clayey soils near the surface where soil weathering is more advanced. The near surface clayey soils are typically underlain by sandy silts and silty sands.

The boundary between soil and rock is not sharply defined. This transitional zone is termed partially weathered rock (PWR) and is normally found overlying the parent bedrock. For engineering purposes, partially weathered rock is defined as residual material with a standard penetration resistance of at least 100 blows per foot. Weathering is facilitated by fractures, joints, and the presence of less resistant rock types. As a result, the profile of the partially weathered rock and hard rock is quite irregular and erratic, even over short horizontal distances. Also, it is not unusual to find lenses and boulders of hard rock and zones of partially weathered rock within the soil mantle, well above the general bedrock level.

6.0 SUBSURFACE CONDITIONS

The borings drilled for this exploration encountered fill and residual soils. Fill materials were encountered in each boring, except boring B-2, extending to depths ranging from 3 feet to 13 feet below the ground surface. The fill soils were noted to consist of firm to very stiff sandy lean clay (CL), loose to firm clayey sand (SC) and very loose to firm silty sand (SM).

The residual soils were encountered beneath the fill soils in the borings noted above and at the ground surface in borings B-2. The residual soils were noted to consist generally of stiff sandy lean clay (CL), firm to very stiff sandy silt (ML) and very loose to dense silty sand (SM). The soils were generally noted to be micaceous. The letters in parentheses represent a visual classification of the soils in accordance with the Unified Soil Classification System. A key to symbols and classification is included as Appendix D.

Boring B-4 encountered very loose/very soft material extending from approximately 43 feet to 61 feet. Three consecutive standard penetration tests between 48 feet and 61 feet were recorded as weight of hammer (woh) and each of these tests did not recover a sample. Very firm silty sand was encountered at a depth of 61 feet and the boring was terminated at a depth of 62.5 feet.

Groundwater was not encountered in the borings at the time of drilling. Measured caved depths in the borings ranged from 30.5 feet to 39 feet. Measured caved depths can sometimes be used to indicate groundwater levels. It is possible that the weight of hammer material identified in boring B-4 between 48 feet and 61 feet was influenced by the presence of groundwater, but we could not confirm this to be the case. It should be noted that groundwater levels may fluctuate several feet with seasonal and rainfall variations and with changes in the water level in adjacent drainage features. Normally, the highest groundwater levels occur in late winter and spring and the lowest levels occur in late summer and fall.

The above descriptions provide a general summary of the subsurface conditions encountered. The Boring Logs included in Appendix C contain detailed information recorded at each boring location. The Boring Logs represent our interpretation of the field logs based on engineering examination of the field samples. The lines designating the interfaces between various strata represent approximate boundaries and the transition between strata may be gradual. It should be noted that the soil conditions will vary between boring locations.

7.0 ANALYSIS AND DESIGN RECOMMENDATIONS

We understand that at least two of the three buildings (Byrnes Hall and Manning Hall) are supported on driven pile foundations with a capacity of 40 tons per pile. Therefore, we have provided the following foundation recommendations based on the understanding that the new additions will utilize a similar foundation system. Based on the subsurface conditions encountered, driven piles at this site will be considered friction piles with little end bearing capacity.

As mentioned previously, boring B-4 (Byrnes Hall) encountered very loose/very soft material between a depth of approximately 43 feet to 61 feet. We suspect that the weight of hammer test results may have been influenced by groundwater, but we could not confirm. Groundwater can create a quick condition in predominantly sandy soils that results in an artificially low standard penetration test result. Mud rotary drilling procedures are required to prevent this condition from occurring and it was beyond the scope of our services to perform mud rotary drilling for this project. The existing building was built approximately 50 years ago and appears to be performing satisfactorily. However, to rule out the possibility that the weight of hammer test results are due to something other than a quick condition caused by groundwater, we recommend that BLE be retained to perform one additional mud rotary boring adjacent to boring B-4. We would then advise whether the following recommendations remain valid for foundations constructed near boring B-4.

7.1 Driven H-Piles

H-piles have the advantages of developing relatively high capacities, of being installed by a relatively large number of potential contractors and of being readily available and relatively easily cut-off or spliced to accommodate length variations. They have the disadvantage, however, of being subject to corrosion, particularly if uncoated. Although not performed as part of this exploration we have performed soil resistivity and pH testing on soils similar to those on this site to evaluate their corrosion potential. Based on our experience in this area, the soils at this site could be expected to have a slight to moderate corrosion potential.

Driven H-piles could develop the desired compression capacities in the fill and residual soils encountered in the borings. Dense soil, partially weathered rock and auger refusal were not encountered in the borings. As a result, the piles will develop their capacities predominantly in skin friction. We recommend that the steel H-piles be designed for an allowable capacity of 40 tons to match the reported capacity of the existing pile foundations. Based on our interpretation of the International Building Code, pile capacities in excess of 40 tons per pile at this site would require a load test. If you wish to consider an allowable pile capacity in excess of 40 tons, the maximum allowable individual pile compression capacity is limited to ½ of the ultimate capacity determined by a full-scale static load test.

The following table presents the length of pile (below the pile cap) required to develop an allowable capacity of 40 tons. These lengths were determined using the program Driven Piles.

Steel H-Pile Type	Pile Length (ft) for 40-ton Allowable Capacity
HP 10x42	42
HP 12x53	38
HP 14x73	32

Final selection of the pile size and capacity should be made based on cost and availability. Cost estimates must include the cap cost to accurately reflect the cost of different pile capacities. Additional analysis would be

required considering the specific pile type and hammer proposed for use to establish preliminary driving criteria and estimate the capacity of each pile/hammer combination.

Based on the anticipated maximum loads, pile groups will be required to provide adequate support for the structure. The support provided by the soil in contact with the pile cap should be omitted from the capacity calculations. We recommend a minimum center to center pile spacing of 2½ to 3 pile diameters. This restriction is necessary to limit surface heave, to enhance the bearing efficiency of the individual piles and to reduce the possibility of damaging previously installed piles.

Piles should be driven continuously from the ground surface to the bearing material without jetting or predrilling. Compatibility of the pile driving equipment and the pile type being driven is an essential element in achieving the required penetration and a satisfactory pile foundation. All equipment should be subject to review by the geotechnical engineer. The pile driving hammer should be properly selected with relation to size, weight, and type of pile specified. The initial driving resistance should be determined by an acceptable dynamic pile driving formula that considers the weight of the pile such as the Wave Equation.

Proper selection of the pile driving hammer based on pile type and ram weight and the use of proper anvil and cushioning material should result in compressive driving stresses in the piles that are within tolerable magnitudes. To prevent over-driving and possible damage to the piles, we recommend that the final driving criteria for the last few inches be carefully specified with respect to the hammer size and pile type. We also recommend that the driving hammer have leads that are fixed to the rig to further minimize movement of the tops of the piles during the pile installation process. In order to minimize heave effects during driving, we recommend that the piles within each pile cap be installed from one side to the other or from the center outward.

We have assumed that less than two feet of structural fill will be placed at the site. We request that we be notified in the event that significant fill placement is anticipated so that we can evaluate its effect on pile capacity.

Proper installation of steel H-piles is critical to achieving a successful foundation and proper installation requires considerable experience, skill and judgment. Therefore, only experienced contractors should be allowed to bid. We recommend that the specifications require the piling contractor to have been in business installing steel H-piles for at least ten years. Also, the piling contractor and the project field superintendent should be required to have installed steel H-piles on at least ten comparable projects during the last two years.

Prior to installing the piles, the geotechnical engineer should be informed of the specific equipment proposed for use by the pile contractor. Based on this information, we would then determine the preliminary penetration resistance values required to achieve the desired compressive capacity.

7.2 Lateral Earth Pressure

Retaining walls must be capable of resisting the lateral earth pressures that will be imposed on them. Walls which will be permitted to rotate at the top, such as cantilever retaining walls, may be designed to resist the active earth pressure. The active earth pressure coefficient is designated as Ka. Typically, a top rotation of about 1 inch per 10 feet height of wall is sufficient to develop active pressure conditions in soils similar to those encountered at the site. We recommend a Ka value of 0.33 for the soils encountered at this site when placed in accordance with the requirements for engineered fill.

Walls which will be prevented from rotating such as laterally braced retaining walls should be designed to resist the at-rest lateral earth pressure. The at-rest earth pressure coefficient is designated as Ko. We recommend a Ko value of 0.5 for the soils encountered at this site when placed in accordance with the requirements for engineered fill.

The passive earth pressure may be considered as the pressure exerted on the side of a foundation which aids in resisting sliding of the foundation. The passive earth pressure coefficient is designated as Kp. Friction resistance along the base of the foundation may also be used to resist sliding. The coefficient of frictional resistance is designated as fs. We recommend a fs value of 0.4 and a Kp value of 3.0 for the soils encountered at this site. Consideration should be given to dividing the passive earth pressure coefficient by a safety factor of 2 to limit the amount of lateral deformation required to mobilize the passive resistance. Published documentation[1] indicates that very little horizontal compression (approximately 0.5% relative to wall height) is required to develop one-half of the available passive resistance, hence the suggested safety factor of 2. However, depending on soil type and relative density it may take 2 to 15% horizontal compression to develop the full passive resistance.

The values presented above assume that the ground surface is level. Sloping backfill (or sloping soil surfaces in front of a footing when considering passive resistance) will dramatically influence the earth pressure coefficients. Bunnell-Lammons Engineering should be consulted concerning applicable earth pressure coefficients where sloping soil surfaces may be present.

The compacted mass unit weight of the backfill soil, which we estimate to be approximately 125 pcf, should be used with the earth pressure coefficients to calculate lateral earth pressures. Lateral pressure arising from surcharge loading, earthquake loading, and groundwater should be added to the above soil earth pressures to determine the total lateral pressures which the walls must resist. Where practical, we recommend that retaining walls and other below grade walls incorporate filtered gravity drainage systems to prevent the buildup of excess hydrostatic pressures behind the walls. In addition, transient loads imposed on the walls by construction equipment during backfilling should be taken into consideration during design and construction. Excessively heavy grading equipment should not be allowed within about 5 feet horizontally of the walls.

7.3 Seismic Site Classification

Geotechnical seismic design requirements are detailed in the International Building Code (IBC). The site class is determined based on the average soil/rock properties within the upper 100 feet. It was beyond the scope of this project to extend borings to a depth of 100 feet. However, based on our knowledge of the area and the conditions encountered in the borings, we recommend that the structures be designed for a Seismic Site Class D.

7.4 Grade Slabs

The grade slab may be soil supported assuming that the site is prepared in accordance with the recommendations in this report. The grade slab should be jointed around columns and along footing supported walls so that the slab and foundations can settle differentially without damage. If slab thickness permits, joints containing dowels or keys may be used in the slab to permit movement between parts of the slab without cracking or sharp vertical displacements.

---

[1] *Soil Mechanics* by T. William Lambe and Robert V. Whitman; Massachusetts Institute of Technology; 1969; p.165.

Floor slabs supported on grade which will be carpeted, tiled, painted or receive some other covering or sealant should incorporate a vapor barrier. The vapor barrier should be installed in accordance with the manufacturer's recommendations.

7.5 Secondary Design Considerations

The following items are presented for your consideration. These items are known to generally enhance performance of structural and pavement systems.

- Roof drainage should be collected by a system of gutters and downspouts and directed away from all structures.
- Sidewalks should be sloped so that water drains away from the structures.
- Site grading and paving should result in positive drainage away from the structures. Water should not be allowed to pond around the structures or in such locations that would lead to saturation of pavement subgrade materials. A minimum slope of approximately ¼ to ½-inch per foot should provide adequate drainage.
- Backfill for utility lines should be placed in accordance with the requirements for engineered fill to minimize the potential for differential settlement.

8.0 CONSTRUCTION RECOMMENDATIONS

8.1 Site Preparation

All existing topsoil, vegetation, trees, roots, disturbed soils, existing construction, unsuitable soils and surface soils containing organic matter or other deleterious materials should be stripped from within the proposed building and pavement areas. Topsoil and organic soils may be stockpiled for later use in areas to be landscaped. Other deleterious material should be disposed of offsite or in areas of the site that will not be developed.

8.2 Drainage

Groundwater was not encountered within the expected excavation depths. However, it should be noted that groundwater levels may fluctuate several feet with seasonal and rainfall variations and with changes in the water level in adjacent drainage features. Normally, the highest groundwater levels occur in late winter and spring and the lowest levels occur in late summer and fall. The contractor should be prepared to promptly remove any surface water or groundwater from the construction area. This has been done effectively on past jobs by means of gravity ditches and pumping from filtered sumps.

8.3 Proofrolling

After stripping and rough excavation grading, we recommend that areas to provide support for the foundations, floor slab, engineered fill and pavement be carefully inspected for soft surficial soils and proofrolled with a 25 to 35-ton, four-wheeled, rubber-tired roller or similar approved equipment. The proofroller should make at least four passes over each location, with the last two passes perpendicular to the first two where practical.

Any areas which wave, rut, or deflect excessively and continue to do so after several passes of the proofroller should be excavated to firmer soils. The excavated areas should be backfilled in thin lifts with engineered fill. The proofrolling and excavating operations should be carefully monitored by an experienced engineering

technician working under the direction of the geotechnical engineer. Proofrolling should not be performed when the ground is frozen or wet from recent precipitation.

8.4 Engineered Fill

All fill used for raising site grade or for replacement of material that is undercut should be uniformly compacted in thin lifts to at least 95 percent of the standard Proctor maximum dry density (ASTM D698). In addition, at least the upper 12 inches of subgrade fill beneath pavements and floor slabs should be compacted to at least 98 percent of the maximum dry density. We recommend that the fill be placed and compacted at a moisture content within three percent of the standard Proctor optimum moisture content.

Based on our visual examination and experience with similar soil types, the on-site soil appears to be generally suitable for use as engineered fill with proper moisture adjustment. In general, soils having a Plasticity Index (PI) greater than 30 (less than 15 is preferable) should not be used for fill. Soils used for engineered fill should be reasonably free from organics (less than 3% organics by weight) and should exhibit a standard Proctor maximum dry density greater than 90 pcf.

Before filling operations begin, representative samples of each proposed fill material should be collected and tested to determine the compaction and classification characteristics. The maximum dry density and optimum moisture content should be determined. Once compaction begins, a sufficient number of density tests should be performed by an experienced engineering technician working under the direction of the geotechnical engineer to measure the degree of compaction being obtained. Existing slopes steeper than 6:1 (horizontal:vertical) should be benched prior to placement of engineered fill such that the fill is placed in horizontal layers and keyed into the existing slopes.

The edge of engineered fill extending above surrounding grade should extend horizontally beyond the outside edge of the building foundations at least 10 feet or a distance equivalent to the height of fill to be placed, whichever is greater, before sloping. Fill slope surfaces should be protected from erosion by grassing or some other means.

The surface of compacted subgrade soils can deteriorate and lose its support capabilities when exposed to environmental changes and construction activity. Deterioration can occur in the form of freezing, formation of erosion gullies, extreme drying, exposure for a long period of time or rutting by construction traffic. We recommend that the surfaces of floor slab and pavement subgrades that have deteriorated or softened be recompacted prior to construction of the floor slab or pavement. Additionally, any excavations through the subgrade soils (such as utility trenches) should be properly backfilled in compacted lifts. Recompaction of subgrade surfaces and compaction of backfill should be checked with a sufficient number of density tests to determine if adequate compaction is being achieved.

8.5 Slopes

The existing walls from the Memorial Auditorium may remain in place and provide the necessary slope support extending from the top of the walls to the wall footing area. Any cut below the walls will need to be shored or slopes as noted below.

Confined temporary excavations such as for utility installation or below-grade wall construction should conform to OSHA regulations. For permanent slopes which are not confined, our experience suggests that excavation side slopes through the existing soil overburden at the site should be laid back at a 2H:1V (horizontal to vertical) slope or flatter. Permanent fill slopes placed on a suitable foundation should be constructed at 2.5:1, or flatter. Fill slopes should be adequately compacted. Cut and fill slope surfaces should

be protected from erosion by grassing or other means. Permanent slopes of 3:1 or flatter may be desirable for mowing.

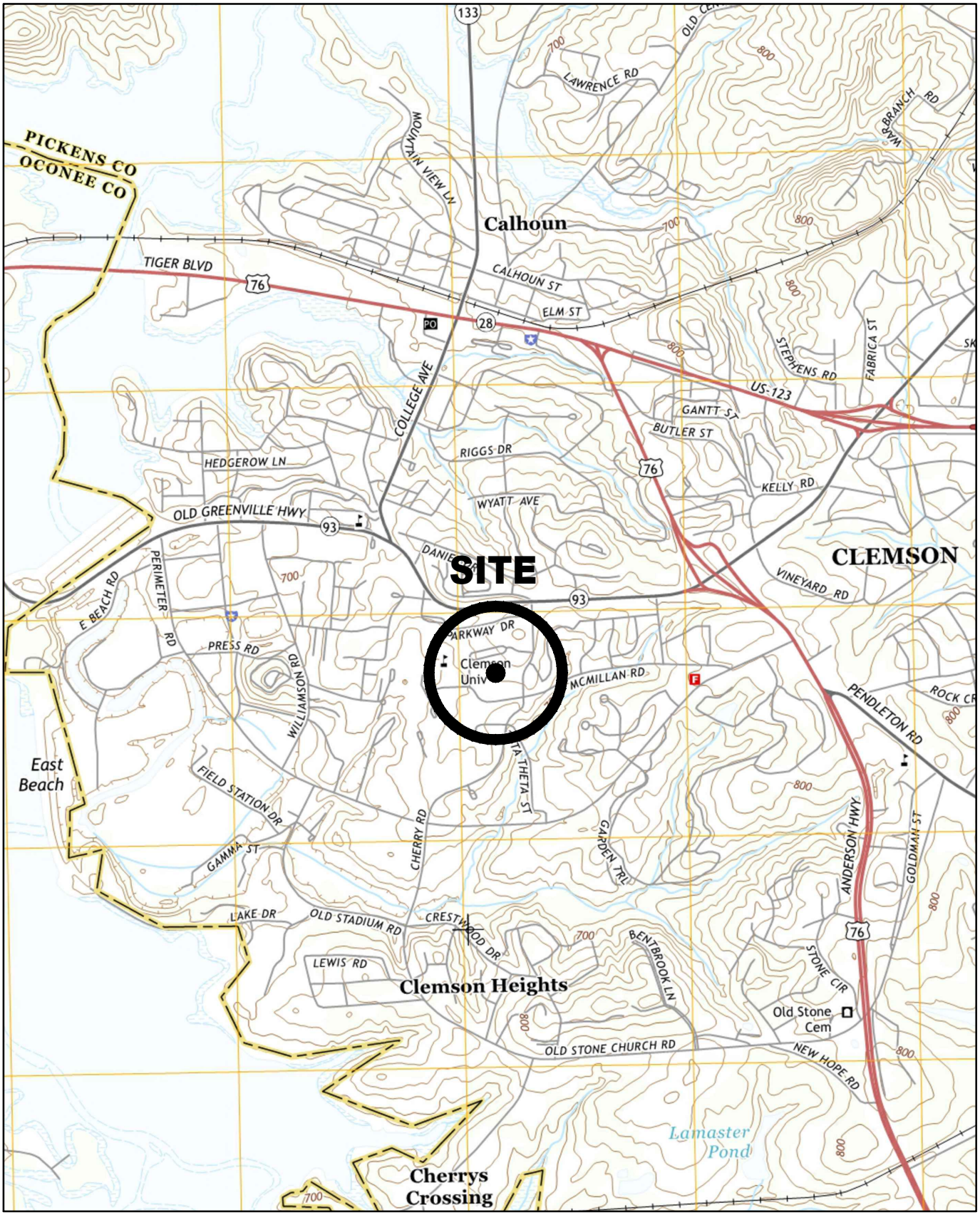
9.0 SPECIFICATIONS REVIEW

It is recommended that Bunnell-Lammons Engineering be retained to make a general review of the foundation and earthwork plans and specifications prepared from the recommendations presented in this report. We would then suggest any modifications so that our recommendations are properly interpreted and implemented. Additional borings and an updated geotechnical report is recommended once the design plans are further developed.

10.0 BASIS OF RECOMMENDATIONS

Our evaluation of foundation support conditions has been based on our understanding of the project information and data obtained in our exploration as well as our experience on similar projects. The general subsurface conditions utilized in our foundation evaluation have been based on interpolation of the subsurface data between the widely spaced borings. Subsurface conditions between the borings may differ. If the project information is incorrect or the structure location (horizontal or vertical) and/or dimensions are changed, please contact us so that our recommendations can be reviewed. The discovery of any site or subsurface conditions during construction which deviate from the data obtained in this exploration should be reported to us for our evaluation. The assessment of site environmental conditions for presence of pollutants in the soil, rock and groundwater of the site was beyond the scope of this exploration. Soil cuttings used as backfill in boreholes will settle over time resulting in a depression at the surface. It is beyond the scope of our services to return to the site to repair boreholes that have exhibited settlement of the backfill soils.

APPENDIX A
Figures



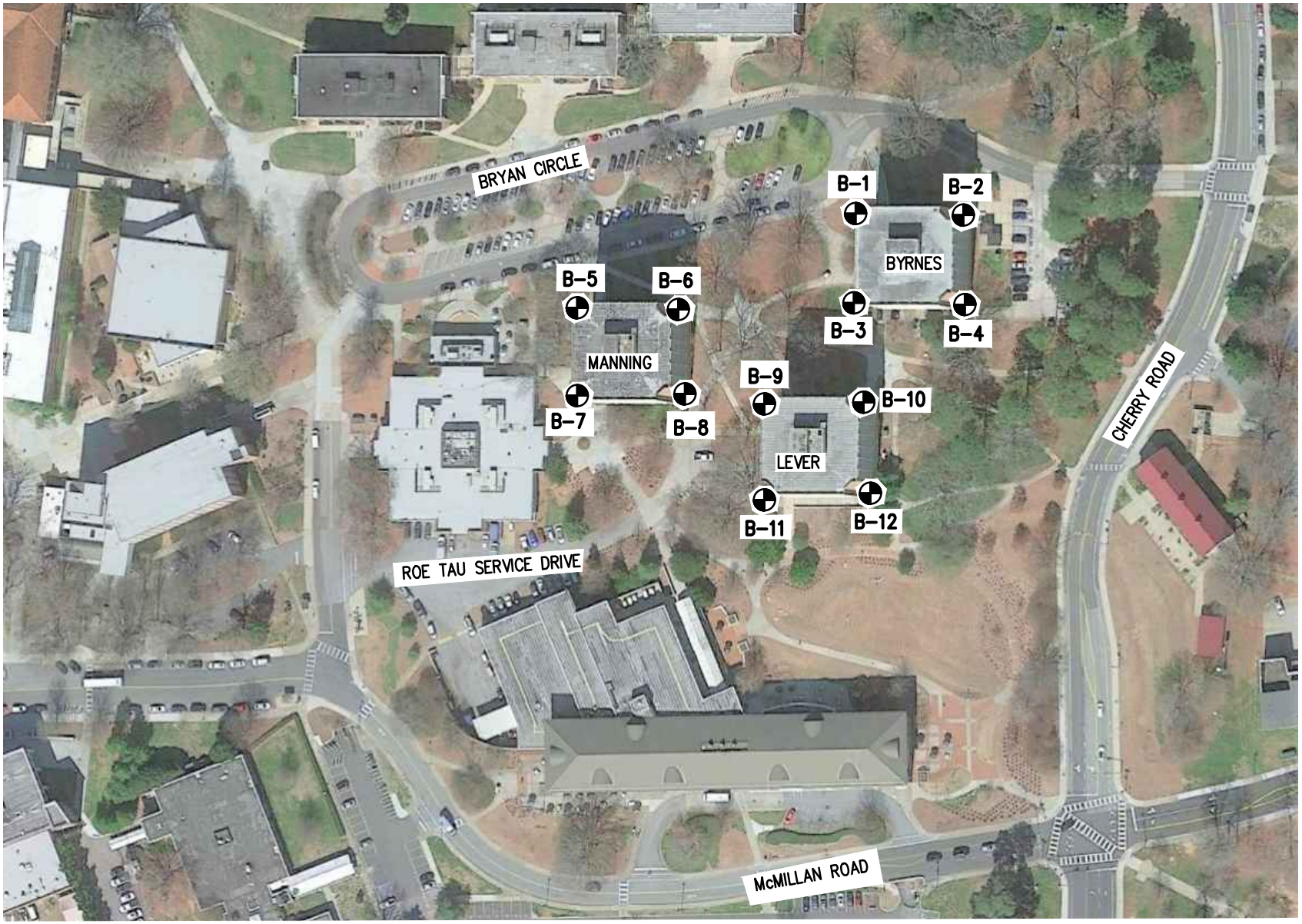
2000 1000 0 2000 4000

APPROXIMATE SCALE IN FEET

REFERENCE:
USGS TOPOGRAPHIC MAP, 7.5 MINUTE SERIES, CLEMSON, S.C. QUADRANGLE, 2014.

DRAWN: ACE	DATE: 07-12-22	BUNNELL LAMMONS ENGINEERING 6004 Ponders Court, Greenville, SC 29615 Phone: (864) 288-1265 Fax: (864) 288-4430	SITE LOCATION MAP BRYAN MALL ADDITIONS CLEMSON UNIVERSITY CLEMSON, SOUTH CAROLINA
CHECKED: JCJ	CAD: BRYANHALLADD-SLM		
APPROVED: WAM	JOB NO: J22-18069-01		

FIGURE
1



150 75 0 150 300

APPROXIMATE SCALE IN FEET

LEGEND

⊕ APPROXIMATE LOCATION OF SOIL TEST BORING

REFERENCE:
GOOGLE EARTH IMAGE DATED 2021.

DRAWN: ACE	DATE: 07-12-22	BUNNELL LAMMONS ENGINEERING	FIGURE
CHECKED: JCJ	CAD: BRYANHALLADD-BLP	6004 Ponders Court, Greenville, SC 29615 Phone: (864) 288-1265 Fax: (864) 288-4430	BORING LOCATION PLAN BRYAN HALL ADDITIONS CLEMSON UNIVERSITY CLEMSON, SOUTH CAROLINA
APPROVED: WAM	JOB NO: J22-18069-01		2

APPENDIX B
Field Exploration Procedures

BUNNELL LAMMONS ENGINEERING

Field Exploration Procedures

The borings were made by mechanically twisting a continuous flight steel auger into the soil. Soil sampling and penetration testing were performed in general accordance with ASTM D 1586. At assigned intervals, soil samples were obtained with a standard 1.4-inch I. D., 2-inch O. D., split-tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, and then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final 12 inches was recorded and is designated the "standard penetration resistance." The penetration resistance, when properly evaluated, is an index to the strength of the soil and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined by a geotechnical engineer to verify the field classifications of the driller. Boring Logs are attached, showing the soil descriptions and penetration resistance.

APPENDIX C
Boring Logs

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-1

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-21-22 END: 6-21-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 32

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT
	Firm to stiff, red and brown, micaceous, fine to medium sandy, lean CLAY with trace silt - (fill)		2 3 2	
5			3 4 5	
			4 4 4	
	Loose to firm, tan and brown, micaceous, silty, fine to medium SAND - (residuum)		2 2 3	
10				
			3 2 3	
15				
	with trace quartz fragments		2 3 3	
20				
	absent quartz fragments		3 4 3	
25				
	gray and brown, fine SAND		3 4 5	
30				
			4 6 8	
35				
			4 5 7	

2 5 10 20 30 40 50 70 90

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BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-1

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-21-22 END: 6-21-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 32

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
45	Loose to firm, gray and brown, micaceous, silty, fine SAND		4 6 9	●
50			3 5 8	●
	Boring terminated at 50.0 feet. No groundwater encountered at time of drilling. Boring caved at 32 feet at time of drilling.			
55				
60				
65				
70				
75				

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-2

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-21-22 END: 6-21-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 31

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	Stiff, red and brown, slightly micaceous, fine to medium sandy, lean CLAY - (residuum)		3 5 5	
	micaceous, with trace silt		3 4 5	
5			3 3 6	
	Loose to firm, tan and brown, micaceous, silty, fine to medium SAND		2 2 3	
10				
			2 3 4	
15				
			3 4 4	
20				
			3 5 6	
25				
			3 3 4	
30	▽			
	Firm, tan and brown, micaceous, fine to medium sandy SILT		3 3 3	
35				
	Loose to firm, gray and tan, micaceous, silty, fine to medium SAND		2 4 5	

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-2

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-21-22 END: 6-21-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 31

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
45	Loose to firm, gray and tan, micaceous, silty, fine to medium SAND		3 5 5	●
	fine SAND		3 5 6	●
50	Boring terminated at 50.0 feet. No groundwater encountered at time of drilling. Boring caved at 31 feet at time of drilling.			
55				
60				
65				
70				
75				

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BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-3

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-21-22 END: 6-21-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 38

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT
	Stiff, red and brown, micaceous, fine to medium sandy, lean CLAY with trace silt - (possible fill)		3 5 5	
	Loose to firm, red and brown, micaceous, silty, fine to medium SAND - (residuum)		5 4 5	
5			3 3 4	
	brown and tan		2 2 3	
10				
			2 4 3	
15				
	tan and dusky red		3 3 3	
20				
			2 3 5	
25				
			3 5 5	
30				
	gray and tan		3 6 8	
35				
			3 6 7	

STANDARD PENETRATION RESULTS BLOWS/FOOT: 2 5 10 20 30 40 50 70 90

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BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-3

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-21-22 END: 6-21-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 38

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	Loose to firm, gray and tan, micaceous, silty, fine to medium SAND			
	brown and gray		3 4 6	●
45				
	gray and tan		5 8 9	●
50	Boring terminated at 50.0 feet. No groundwater encountered at time of drilling. Boring caved at 38 feet at time of drilling.			
55				
60				
65				
70				
75				

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-4

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-21-22 END: 6-21-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 36

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
0	Stiff to very stiff, red and brown, micaceous, fine to medium sandy, lean CLAY with trace silt - (fill)			3 5 8
				4 7 11
5				6 9 13
	Firm, tan and brown, micaceous, silty, fine to medium SAND with trace hairlike roots - (fill)			5 6 6
10				
	Firm to very loose, tan and brown, micaceous, silty, fine to medium SAND - (residuum)			3 4 5
15				
				4 5 8
20				
				5 4 7
25				
				4 6 6
30				
				3 5 4
35				
	with trace clay			2 3 3

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-4

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-21-22 END: 6-21-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 36

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
45	Firm to very loose, tan and brown, micaceous, silty, fine to medium SAND with trace clay with trace rock fragments		1 1 1	●
50	No recovery		woh woh woh	
55			woh woh woh	
60			woh woh woh	
	Very firm, tan and brown, micaceous, silty, fine to medium SAND with rock fragments		8 11 16	●
65	Boring terminated at 62.50 feet. No groundwater encountered at time of drilling. Boring caved at 36 feet at time of drilling.			
70				
75				

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-5

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-23-22 END: 6-23-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 38

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	Stiff, red and brown, micaceous, fine to medium sandy, lean CLAY with trace silt and hairlike roots - (fill)		3 5 5	
5			3 4 7	
	Firm, red and brown, micaceous, clayey, fine to medium SAND - (fill)		5 7 6	
	Loose, red and brown, micaceous, silty, fine to medium SAND - (residuum)		2 3 4	
10				
	Stiff, tan and brown, slightly micaceous, fine to medium sandy SILT		3 5 5	
15				
	Loose to firm, brown and dusky red, micaceous, silty, fine to medium SAND		4 6 5	
20				
			4 4 5	
25				
			5 6 8	
30				
	Stiff, white, tan and brown, slightly micaceous, fine to medium sandy SILT		4 5 7	
35				
	Loose, gray and brown, micaceous, silty, fine to medium SAND		3 5 5	

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-5

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-23-22 END: 6-23-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 38

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
45	Loose, gray and brown, micaceous, silty, fine to medium SAND		2 4 6	●
50			3 4 5	●
	Boring terminated at 50.0 feet. No groundwater encountered at time of drilling. Boring caved at 38 feet at time of drilling.			
55				
60				
65				
70				
75				

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-6

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-23-22 END: 6-23-22

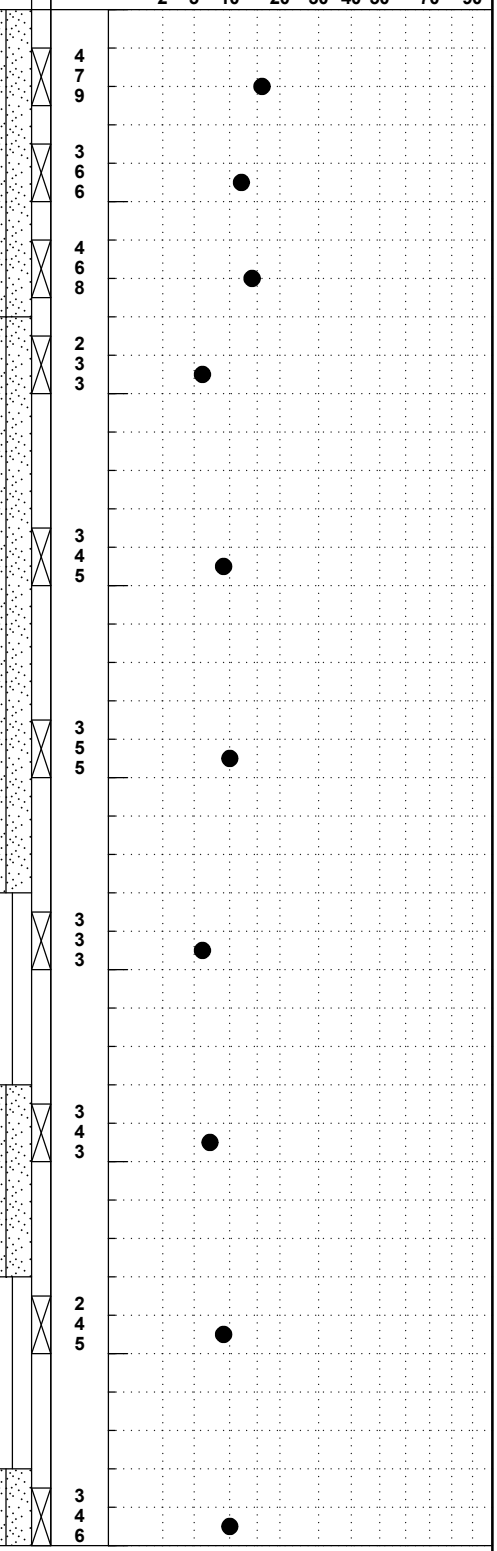
LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 31

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT
	Firm, tan and brown, micaceous, silty, fine to medium SAND with trace clay - (fill)		4 7 9	
			3 6 6	
5	with trace hairlike roots		4 6 8	
	Loose, tan and brown, micaceous, silty, fine to medium SAND - (residuum)		2 3 3	
10				
	tan and dusky red		3 4 5	
15				
	tan and brown		3 5 5	
20				
	Firm, tan and red, slightly micaceous, fine to medium sandy SILT		3 3 3	
25				
	Loose, red and tan, micaceous, silty, fine to medium SAND		3 4 3	
30	▨			
	Stiff, tan and brown, slightly micaceous, fine to medium sandy SILT		2 4 5	
35				
	Loose to firm, tan and brown, micaceous, silty, fine to medium SAND		3 4 6	



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BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-6

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-23-22 END: 6-23-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 31

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
45	Loose to firm, tan and brown, micaceous, silty, fine to medium SAND		3 5 8	●
			5 7 11	●
50	Boring terminated at 50.0 feet. No groundwater encountered at time of drilling. Boring caved at 31 feet at time of drilling.			
55				
60				
65				
70				
75				

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BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-7

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-23-22 END: 6-23-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 38

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT
	2-inches of MULCH			
	Very loose, tan and brown, micaceous, silty, fine to medium SAND - (fill)			2 2 2
	Firm, red and brown, micaceous, fine to medium sandy, lean CLAY with hairlike roots and silt - (fill)			2 3 4
5				3 3 4
	Loose to firm, white and dusky red, micaceous, silty, fine to medium SAND - (residuum)			3 4 5
10				
	fine SAND			3 3 3
15				
	white, red, and tan, moist, fine to medium SAND			3 5 4
20				
				3 6 6
25				
				3 4 6
30				
	Firm, tan and brown, slightly micaceous, fine to medium sandy SILT			3 3 3
35				
	Firm to loose, white, red and tan, micaceous, silty, fine to medium SAND			3 5 7

STANDARD PENETRATION RESULTS BLOWS/FOOT: 2 5 10 20 30 40 50 70 90

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BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-7

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-23-22 END: 6-23-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 38

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
45	Firm to loose, white, red and tan, micaceous, silty, fine to medium SAND		4 6 8	●
	white and tan		3 4 6	●
50	Boring terminated at 50.0 feet. No groundwater encountered at time of drilling. Boring caved at 38 feet at time of drilling.			
55				
60				
65				
70				
75				

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BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-8

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-23-22 END: 6-23-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 32

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT
	2-inches of MULCH			
	Loose, red and brown, micaceous, clayey, fine to medium SAND with trace debris (plastic) - (fill)		2 2 3	
	Loose, red and brown, micaceous, silty, fine to medium SAND - (residuum)		2 3 3	
5	white and dusky red		3 4 5	
	brown and dusky red		3 3 3	
10				
			2 4 3	
15				
	Stiff, dusky red and tan, moist, micaceous, fine to medium sandy SILT		3 6 9	
20				
	Loose, tan and brown, micaceous, silty, fine to medium SAND		2 3 3	
25				
	Firm to stiff, tan and brown, micaceous, fine to medium sandy SILT		3 4 3	
30				
			3 5 6	
35				
	Loose to very firm, brown and tan, micaceous, silty, fine to medium SAND		4 5 5	

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-8

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-23-22 END: 6-23-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 32

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
45	Loose to very firm, brown and tan, micaceous, silty, fine to medium SAND		6 8 11	●
50			7 10 13	●
	Boring terminated at 50.0 feet. No groundwater encountered at time of drilling. Boring caved at 32 feet at time of drilling.			
55				
60				
65				
70				
75				

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BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-9

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-22-22 END: 6-22-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 30.5

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	Firm, tan and brown, micaceous, silty, fine to medium SAND with trace rock fragments and roots - (fill)		3 3 9	
	Stiff, red and brown, micaceous, fine to medium sandy, lean CLAY - (residuum)		4 6 7	
5			5 8 4	
	Loose to firm, brown and dusky red, micaceous, silty, fine to medium SAND		3 5 5	
10				
			2 3 4	
15				
			3 4 3	
20				
			4 6 6	
25				
			3 5 9	
30				
	dusky red and tan		4 8 10	
35				
	Firm, brown and tan, slightly micaceous, fine to medium sandy SILT		3 3 3	

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BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-9

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-22-22 END: 6-22-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 30.5

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	Firm, brown and tan, slightly micaceous, fine to medium sandy SILT			
45	Firm, tan and brown, micaceous, silty, fine to medium SAND		5 7 8	●
			4 6 5	●
50	Boring terminated at 50.0 feet. No groundwater encountered at time of drilling. Boring caved at 30.5 feet at time of drilling.			
55				
60				
65				
70				
75				

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BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-10

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-22-22 END: 6-22-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 34

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT
	Stiff, red and brown, micaceous, fine to medium sandy, lean CLAY with trace silt - (fill)		2 4 6	
	Firm to loose, red and brown, micaceous, silty, fine to medium SAND with trace clay - (residuum)		4 8 11	
5			5 6 6	
	tan and dusky red		3 3 5	
10				
			2 3 4	
15				
			3 5 4	
20				
			4 4 5	
25				
	Stiff, brown and tan, micaceous, fine to medium sandy SILT		3 5 7	
30				
	Firm to very firm, dusky red and tan, micaceous, silty, fine to medium SAND		3 6 5	
35				
			4 5 8	

STANDARD PENETRATION RESULTS BLOWS/FOOT: 2 5 10 20 30 40 50 70 90

GEOT_NOWELL 18069-01.GPJ 7/28/22

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-10

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-22-22 END: 6-22-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 34

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
45	Firm to very firm, dusky red and tan, micaceous, silty, fine to medium SAND		6 8 8	●
	tan and brown		5 9 14	●
50	Boring terminated at 50.0 feet. No groundwater encountered at time of drilling. Boring caved at 34 feet at time of drilling.			
55				
60				
65				
70				
75				

GEOT_NOWELL 18069-01.GPJ 7/28/22

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-11

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-22-22 END: 6-22-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 34.5

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT
	Stiff, red and brown, micaceous, fine to medium sandy, lean CLAY with hairlike roots - (fill)		3, 5, 6	
5	Firm to very firm, red and brown, micaceous, silty, fine to medium SAND with trace clay - (residuum)		4, 8, 10	
			6, 9, 13	
10			3, 5, 7	
15	Stiff, red and brown, moist, slightly micaceous, fine to medium sandy SILT		2, 4, 6	
20	Firm to dense, red and tan, slightly micaceous, silty, fine to medium SAND		7, 8, 14	
25			5, 6, 5	
30			4, 8, 9	
35			9, 9, 12	
	with trace rock fragments		17, 21, 12	

STANDARD PENETRATION RESULTS BLOWS/FOOT: 2 5 10 20 30 40 50 70 90

GEOT_NOWELL 18069-01.GPJ 7/28/22

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-11

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-22-22 END: 6-22-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 34.5

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
45	Firm to dense, red and tan, slightly micaceous, silty, fine to medium SAND with trace rock fragments			
	absent rock fragments		4 6 9	●
	with quartz fragments		5 12 12	●
50	Boring terminated at 50.0 feet. No groundwater encountered at time of drilling. Boring caved at 34.5 feet at time of drilling.			
55				
60				
65				
70				
75				

GEOT_NOWELL 18069-01.GPJ 7/28/22

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-12

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-22-22 END: 6-22-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 39

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT
	Stiff, red and brown, micaceous, fine to medium sandy, lean CLAY - (fill)		2 3 6	
	No recovery		3 7 6	
5			3 3 5	
	Stiff, red and brown, moist to wet, micaceous, fine to medium sandy, lean CLAY - (fill)		3 6 9	
10				
	Very firm to firm, dusky red and tan, micaceous, silty, fine to medium SAND - (residuum)		7 10 13	
15				
			5 7 8	
20				
			5 6 6	
25				
			3 5 10	
30				
	Stiff to very stiff, dusky red and tan, micaceous, fine to medium sandy SILT		4 6 7	
35				
			5 6 5	

STANDARD PENETRATION RESULTS BLOWS/FOOT: 2 5 10 20 30 40 50 70 90

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST BORING NO. B-12

PROJECT: Bryan Mall Additions — PROJECT NO.: J22-18069-01

CLIENT: The Boudreaux Group — START: 6-22-22 END: 6-22-22

LOCATION: Clemson, South Carolina — ELEVATION:

DRILLER: Southern Drill, Inc., H. Wessinger — LOGGED BY: S. Interlicchia

DRILLING METHOD: CME 550; 2-1/4 inch hollow stem augers

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> 39

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
45	Stiff to very stiff, dusky red and tan, micaceous, fine to medium sandy SILT		4 8 9	●
50			3 6 11	●
	Boring terminated at 50.0 feet. No groundwater encountered at time of drilling. Boring caved at 39 feet at time of drilling.			
55				
60				
65				
70				
75				

GEOT_NOWELL 18069-01.GPJ 7/28/22

APPENDIX D
A Key to Soil Classification

KEY TO SOIL CLASSIFICATIONS AND CONSISTENCY DESCRIPTIONS

BUNNELL-LAMMONS ENGINEERING, INC.
GREENVILLE, SOUTH CAROLINA

Penetration Resistance* Blows per Foot	Relative Density
SANDS	
0 to 4	Very Loose
5 to 10	Loose
11 to 20	Firm
21 to 30	Very Firm
31 to 50	Dense
over 50	Very Dense

Penetration Resistance* Blows per Foot	Consistency
SILTS and CLAYS	
0 to 2	Very Soft
3 to 4	Soft
5 to 8	Firm
9 to 15	Stiff
16 to 30	Very Stiff
31 to 50	Hard
over 50	Very Hard

*ASTM D 1586

Particle Size Identification

Boulder: Greater than 300 mm
Cobble: 75 to 300 mm
Gravel:
Coarse - 19 to 75 mm
Fine - 4.75 to 19 mm
Sand:
Coarse - 2 to 4.75 mm
Medium - 0.425 to 2 mm
Fine - 0.075 to 0.425 mm
Silt & Clay: Less than 0.075 mm

KEY TO DRILLING SYMBOLS


Grab Sample


Split Spoon Sample


Undisturbed Sample

NR = No reaction to HCL

NA = Not applicable

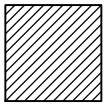
NS = No sample

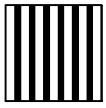

Groundwater Table at Time of Drilling

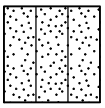

Groundwater Table 24 Hours after Completion of Drilling

KEY TO SOIL CLASSIFICATIONS

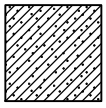

Well-graded Gravel
GW

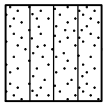

Low Plasticity Clay
CL

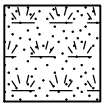

Clayey Silt
MH


Silty Sand
SM

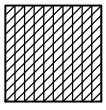

Poorly-graded Gravel
GP

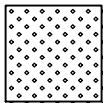

Sandy Clay
CLS

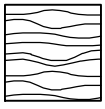

Sandy Silt
MLS


Topsoil
TOPSOIL

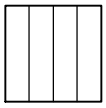

Partially Weathered Rock
BLDRCBBL

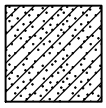

Silty Clay
CL-ML

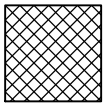

Sand
SW

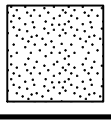

Liquid Sludge
SLUDGE

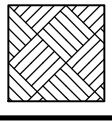

High Plasticity Clay
CH

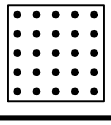

Silt
ML


Clayey Sand
SC


Fill
FILL


Poorly Graded Sand
SP


Bedrock
BEDROCK


Waste
WOOD

APPENDIX E
Important Information About This Geotechnical Report

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

BUNNELL LAMMONS ENGINEERING

January 26, 2023

Boudreaux
1519 Sumter Street
Columbia, South Carolina 29201

Attention: Mr. Randall Huth, AIA

Subject: **Addendum to Report of Geotechnical Exploration**
Bryan Mall Additions
Clemson University
Clemson, South Carolina
BLE Project No. J22-18069-01

Mr. Huth:

Bunnell-Lammons Engineering, Incorporated (BLE) is pleased to present the following addendum to the Report of Geotechnical Exploration performed for the proposed Bryan Mall additions on the Clemson University campus in Clemson, South Carolina (reference BLE Project No. 18069-01, dated August 2, 2022).

Based on the information provided by Mr. Mark Irving, P.E., with MMSA, Inc. to our Mr. Jason Jansante, there will be a generator pad and associated load bearing walls within the southeast corner of Byrnes Hall (near boring B-4). The total load of the generator pad will be 48 kips considering the weight of the generator and concrete pad. Loading information was not available for the walls. However, we assumed that the maximum static dead load will be less than or equal to 5 kips per foot.

Foundations – Wall Footings

Based on the boring data and our experience with similar soil conditions, the encountered fill and residual soils are suitable for shallow foundation support of the proposed construction. Satisfactory performance of the shallow foundations is subject to the criteria and site preparation recommendations contained in this report.

Wall foundations bearing in approved fill or residual soils may be sized for an allowable bearing pressure of 3,000 pounds per square foot (psf). Foundations bearing on new engineered fill that is placed on approved soil and compacted to at least 95 percent of the standard Proctor maximum dry density (ASTM D698), as recommended later in this report, may also be sized for an allowable bearing pressure of 3,000 psf.

We recommend that the minimum widths for continuous wall footings be 18 inches. The minimum width will provide a margin of safety against a local or punching shear failure of the foundation soils. Footings should bear at least 18 inches below final grade to provide frost protection and protective embedment. We recommend that walls be provided with movement joints to accommodate some possible differential settlement.

Exposure to the environment may weaken the soils at the foundation bearing level if the foundation excavations remain open for long periods of time. Therefore, we recommend that once each foundation excavation is extended to final grade, the foundation be constructed as soon as possible to minimize the potential damage to bearing soils. The foundation bearing area should be level or benched and free of loose soil, ponded water and debris. Foundation concrete should not be placed on soils that have been disturbed by seepage. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom prior to placement of concrete. If the excavation must remain open overnight or if rainfall becomes imminent while the bearing soils are exposed, we recommend that a 2 to 4-inch thick "mud-mat" of "lean" (2,000 psi) concrete be placed on the bearing soils for protection before the placement of reinforcing steel.

To verify that the soils encountered in footing excavations are similar to those encountered by the soil test borings, we recommend that foundation excavations be examined. Part of this examination should include checking the foundation bearing soils with a dynamic cone penetrometer performed by an experienced engineering technician working under the direction of the geotechnical engineer.

Settlement – Generator Pad & Wall Footing

We conducted settlement estimates assuming conventional shallow foundations were used to support the structures. The settlement estimates are based on the maximum assumed wall load of 5 kips per foot. Assuming foundations are designed and constructed in accordance with the recommendations presented in this report, we estimate the total foundation settlement to be approximately 1 inch or less. Maximum differential settlement between adjacent similarly loaded foundations is estimated to be approximately ¾ inch or less.

We conducted additional settlement estimates for the generator pad based on the anticipated loading of 48 kips. Based on the provided dimensions of the generator pad, this will result in an applied bearing pressure of 0.35 ksf. This results in an estimated 0.5 inches of settlement for the generator pad.

Closing

We appreciate the opportunity to continue providing our professional services on this project. If you have any questions or require additional assistance, please call.

Sincerely,

BUNNELL-LAMMONS ENGINEERING, INC.

Jason C. Jansante, P.E.
Project Engineer
Registered, S.C. #34614

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER 1/26/23 NO. 34614 JASON C. JANSANTE

William A. Mathews, P.E.
Chief Engineer
Registered, S.C. #14039

SOUTH CAROLINA BUNNELL-LAMMONS ENGINEERING, INC. No. C01452 CERTIFICATE OF AUTHORIZATION

SECTION 01 10 00 - SUMMARY

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 the following:

1. Work covered by the Contract Documents.
2. Definition of Roles in the Performance of Work.
3. Type of the Contract.
4. Use of premises.
5. Owner's occupancy requirements.
6. Work restrictions.
7. Specification formats and conventions.
8. Owner Furnished Owner Installed (OFOI) items.
9. Owner Furnished Contractor Installed (OFCI) items.
10. Owner's Tree Protection Policy.

B. Related Sections include the following:

1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Clemson University, Bryan Mall High Rises Renovation, Byrnes Hall.

1. Project Location: Clemson University, Bryan Mall, Bryan Circle. Byrnes Hall building.

B. Owner: Clemson University, Clemson, South Carolina
Owner's Representative: Al Cope. cope2@clemson.edu
phone: (864) 643-6211

C. Architect of Record: The Boudreaux Group Inc., P.O. Box 5695 (1519 Sumter Street,) Columbia, SC 29250 (29201).

D. Construction Manager at Risk (referred to herein as CM@R): Juneau Construction Company, 210 Interstate North Pkwy, Suite 700, Atlanta, GA 30339.

E. The Work consists of the following for Base Bid Work:

1. The Work includes an all the work illustrated by the Construction Documents, including Drawings and Project Manual, for the Clemson University, Bryan Mall High Rises, Renovations, Byrnes Hall.

    a. Refer to specification section 01 23 00 Alternates with references to documents for bid alternates, for alternate bid prices in addition to the base bid price.

1.4 DEFINTION OF ROLES IN THE PERFORMANCE OF WORK:

A. The Construction Manager at Risk: The Construction Manager at Risk (CM@R) will invite bids for major components of the construction work. The CM@R will not self-perform any construction work for which subcontractor bids are invited, unless no acceptable bids are received or a subcontractor fails to perform.

B. Subcontractors: Invited bidders who will perform the work and who hold contracts directly with the CM@R are referred to as 'subcontractors'.

C. Subcontractors at Every Tier: Construction companies who subcontract with the 'subcontractors' defined above are referred to as "subcontractors at every (or any) tier".

D. Contractor: Where the generic term 'contractor' is used, the 'contractor' ***is the CM@R*** or the construction company contractually responsible to perform the work ***as contracted with the CM@R***, including either a subcontractor (as defined above) or a 'subcontractor at any tier' (as defined above). ~~The term 'contractor' does NOT refer to the CM@R.~~

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E. Imperative Sentences and Statements: All imperative sentences and statements, which give a direct command, without being directed specifically to the CM@R or its Subcontractors or to the generic term 'Contractor'; are addressed to the Subcontractor, or Sub-subcontractor at any tier as defined above who are contractually responsible to perform the work, **and are NOT addressed to the CM@R.**

F. Contractor and Subcontractor in the same statement: Where the generic terms 'contractor' and 'subcontractor' are used in the same statement to express a contractual relationship between the two, the term 'contractor' applies to the term 'contractor' as defined above and the term 'subcontractor' refers to the 'subcontractor at any tier' as defined above that has a contractual obligation to the 'contractor'.

1.5 TYPE OF CONTRACT

A. Project will be constructed under the Construction Manager at Risk (CM@R) Delivery Method with a Guaranteed Maximum Price (GMP.) As such, the CM@R is already under contract with the Owner. Refer to CM@R's Subcontractor Request for Proposal (RFP) for all subcontract types and requirements.

1.6 USE OF PREMISES

A. General: CM@R shall determine the limits of construction and use of premises based on Owner requirements and agreed upon site logistics plan.

B. CM@R shall identify lay down area in accordance with owner approved site logistics plan and tree preservation requirements.

C. The CM@R shall barricade all construction areas and activities and provide appropriate temporary warning and directional signage.

D. Barricade and provide a construction fence around all excavation and new and temporary construction that is elevated above grade.

E. Parking requirements and restrictions shall be communicated in CM@R Subcontractor RFP.

1.7 OWNER'S OCCUPANCY REQUIREMENTS

A. The owner will NOT occupy any areas of the site defined by the construction fence around Byrnes Hall and around designated areas of the site adjacent to Byrnes Hall and contiguous with Byrnes Hall until after substantial completion.

B. The owner will occupy the adjacent Lever Hall and Manning Hall high rise buildings and the site logistics plan shall account for the safe pedestrian circulation, and required vehicular access and continual utility connections at all times of adjacent occupied facilities except as coordinate with the University for necessary temporary shut downs to perform the work and as indicated below.

1.8 WORK RESTRICTIONS

A. Work Hours: Work shall be generally performed during normal business working hours of 7:30 a.m. to 6:00 p.m., Monday through Friday, except otherwise indicated.

1. The CM@R is to request approval to work weekend hours from the Owner's project manager. If weekend hours are approved and worked the following work hours schedule restrictions on the weekends shall be followed:

a. Saturday Hours: 10:00 a.m. to 6:00 p.m.
b. Sunday Hours: 12:00 noon to 6:00 p.m.
c. Truck hauling and deliveries should not be scheduled during Saturday football games: In the year 2023, home games are currently scheduled for Sept 9, Sept 16, Sept 23, Oct 7, Nov 4, Nov 11, and Nov 18.

B. Restrictions during Move-in and Move-out: The CM@R’s site logistic may be impacted by Clemson’s need to move students in and out of the adjacent residence halls during the months of August and May for a 3 to 5 day period.

1. Corporate fully with Clemson's project manager to coordinate logistics well in advance so the Contractor's construction activities can be adjusted accordingly.

C. Exam Weeks: Construction activities during Clemson's exam weeks will be limited to work that does not include loud disturbing noises which would be disruptive to students' abilities to study and prepare for exams during exam weeks.

1. Coordinate these weeks with Clemson's project manager and schedule loud construction activities around these weeks.
2. Consultant with Clemson's project manager to determine what construction activities will and will not be allowed during exam weeks.

D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than three days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

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.

1.10 OWNER FURNISHED OWNER INSTALLED ITEMS (OFOI)

A. Window Treatments: Window treatments indicated in the construction documents are to be Contractor Furnish and Contractor installed (CFCI). All additional window treatments NOT indicated on the construction documents are to Owner Furnished and Owner Installed (OFOI).

B. Signage: Building identification signs, room number signage, code required signage and other interior specialty signage and graphics, will be Owner Furnished and Owner Installed (OFOI).

1. Code required signage to be provided by the Owner is identified on the documents.

a. CM@R is to assure coordination of the owner provided signage is provided in time for substantial completion since it includes code required signage. If the owner's signage will not be read for installation ahead of the CM@R's scheduled substantial completion date, the CM@R is to provide temporary signage for the code required signage to acquire substantial completion without delay.

C. The following items are to be Owner Furnished and Owner Installed (OFOI) as indicated in the construction documents. This work may be furnished by and installed by the Owner's Vendor instead of the owner. CM@R to coordinate installation and schedule with Owner's vendors.

1. Washers and Dryers in the Laundry room

a. Contractor is responsible for all plumbing, ventilation and electrical rough-ins as indicated on the drawings.

2. Vending Machines in the Laundry room.
3. Full size refrigerators at the Level 0 common kitchen and the two staff apartments on Level 1.
4. Residential grade washing machine and dryer at the two staff apartments on Level 1.
1. ADA accessible glass top range at two staff apartments on Level 1.
2. 3/4 size refrigerators at the 4th and 8th levels.
3. Loose microwave resting on shelf at the 4th and 8th levels.
4. Waste receptacles in restrooms.
5. Room key hook cabinets provided in the office area the Level 1.
6. Loose bedroom furniture in upper levels bedrooms.

1.11 OWNER FURNISHED CONTRACTOR INSTALLED ITEMS (OFCI)

A. The following items are to be Owner Furnished and Contractor Installed (OFCI) as indicated in the construction documents:

1. Emergency Key Boxes (Knox Box) at Fire Command Room Door 116.1 and Stair Entrance Door GST2.1.
2. ADA accessible built in oven at Level 0 common kitchen.

3. ADA accessible built in microwave.
4. ADA accessible built in cook top at Level 0 common kitchen.
5. Battery Operated Automatic Electric Paper Towel Dispensers.
6. Soap Dispensers.
7. Double Roll Bathroom Tissue Dispensers in Suite Restrooms and Public Restrooms.

1.12 OWNER'S TREE PROTECTION POLICY

A. In addition to tree preservation requirements specifically indicated on drawings and included on specifications, Refer to Clemson University's Tree Protection Policy for contractor's tree protection requirements and restrictions at the following web site location:

1. http://media.clemson.edu/facilities/pdf/policies_and_procedures/Tree_Protection.pdf

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 22 00 - UNIT PRICES

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. Section includes administrative and procedural requirements for unit prices.

B. Related Requirements:

1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Section 014000 "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

A. Unit price is a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

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

B. 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.

C. List of Unit Prices: A schedule of unit prices is included in Part 3. 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 SCHEDULE OF UNIT PRICES

A. Unit Price 1: Removal of unsatisfactory soil material or rock.

1. Description: Unsatisfactory soil and rock excavation and disposal off site as is necessary to provide proper compaction and soil bearing capacity under building foundations and floor slabs on grade as determined by Owner's soil testing agency.
2. Unit of Measurement: Cubic yard (Cubic meter) of soil excavated, based on survey of volume removed."

B. Unit Price 2: Replacement of unsatisfactory soil or rock excavation with suitable on site fill material.

1. Description: Replacement of unsatisfactory soil material or rock excavation as is necessary to provide proper compaction and soil bearing capacity under building foundations and floor slabs on grade with suitable on-site replacement fill material.
2. Unit of Measurement: Cubic yard (Cubic meter) of soil excavated, based on survey of volume replaced.

C. Unit Price 3: Replacement of unsatisfactory soil or rock excavation with suitable off-site fill material.

1. Description: Replacement of unsatisfactory soil material or rock excavation as is necessary to provide proper compaction and soil bearing capacity under building foundations and floor slabs on grade with suitable off-site replacement fill material.
2. Unit of Measurement: Cubic yard (Cubic meter) of soil excavated, based on survey of volume replaced.

END OF SECTION 01 22 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

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. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Refer to the CM@R's Request for Proposals under the paragraph titled 'Submittals' for submittal requirements for substitution requests. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project.
j. In coordination with the CM@R, detailed comparison of CM@R'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 date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify CM@R of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect the construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution 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.
b. Requested substitution does not require extensive revisions to the Contract Documents.

c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. 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.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

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.

B. Related Sections include the following:

1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

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."; unless another form is agreed upon by all parties and is used consistently throughout the project.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work to the CM@R that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications. The CM@R will facilitate the process and execution of all Owner-Initiated Modifications Proposal with CM@R’s subcontractors and will keep an updated log with status of approval of all such proposals.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed changes. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include costs of labor and supervision directly attributable to the change.
d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

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 to Architect through the CM@R. The CM@R will facilitate all Contractor-Initiated Modifications Proposal and will keep an updated log with status of approval of all such proposals.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 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 forms identified in the Contract, including General and Supplementary Conditions.

1. All Change Orders shall be submitted on Form SE-480 "Construction Change Order" with appropriate documentation attached, unless another form is agreed upon by all parties and is used consistently throughout the project.

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 forms identified in the Contract, including General and Supplementary Conditions.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Work Change Directive: Architect may issue a Work Change Directive on forms **AIA Document G714.** Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Work 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 Work Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

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.

B. Related Sections include the following:

1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by CM@R allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing CM@R's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: The CM@R is to correlate line items in the Schedule of Values with Application for Payment forms with Continuation Sheets.

1. The CM@R is to submit the Schedule of Values to Architect with initial Applications for Payment.

B. Format and Content: The CM@R is to 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 Technical Specification Section

1. Identification: The CM@R is to 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. The CM@R is to submit draft of AIA Document G703 Continuation Sheets.

3. The CM@R is to 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. Change Orders (numbers) that affect value.
d. Dollar value.

1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

4. The CM@R is to 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.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. The CM@R is to 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. The CM@R is to provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

9. Schedule 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.

1.5 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.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets 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.

E. Transmittal: The CM@R is to submit 3 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. A digital process may be agreed to in advance of the first pay application by the Owner, Architect and Contractor.

F. Waivers of Mechanic's Lien: With each Application for Payment, the CM@R is to submit waivers of mechanic's liens from subcontractors, and major sub-subcontractors for construction period covered by the previous application.
1. When an application shows completion of an item, submit final or full waivers.
2. Owner reserves the right to designate which entities involved in the Work must submit waivers.
3. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

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
4. Products list.
5. List of Contractor's staff assignments.
6. List of Contractor's principal consultants.
7. Copies of building permits.
8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
9. Initial progress report.
10. Report of preconstruction conference.
11. Certificates of insurance and insurance policies.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, he CM@R is to 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.

I. Final Payment Application: The CM@R is to 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 and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work, if applicable.
9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

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. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from CM@R or a subcontractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: CM@R is to prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: CM@R is to coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

C. CM@R is to 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.

D. Administrative Procedures: CM@R is to coordinate scheduling and timing of required administrative procedures with construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.

8. Startup and adjustment of systems.

E. Conservation: CM@R is to coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 BIM MODELING COORDINATION

A. BIM Modeling Coordination: The CM@R is to coordinate the preparation of digital, object based 3D computer models to depict, inform and coordinate with building systems within the scope of the work with all subcontractors. Subcontractors are to refer the CM@R's Request for Proposals for all requirements, including the coordination of systems, collision avoidance, and facility maintainability.

1. CM@R will perform three-dimensional component conflict analysis with subcontractors as part of 3D computer modeling coordination. Resolve component conflicts prior to submittal. Indicate where conflict resolution requires modification of design requirements by Architect.
2. Architect will furnish CM@R one set of digital data files of Drawings and 3D Models for use in preparing BIM model. Architect makes no representations as to the accuracy or completeness of digital data files.
3. Digital Data Software Program: Site Drawings are available in AutoCAD recent version. All other drawings and building models are available in Revit 2022.
4. CM@R shall execute a data licensing agreement in the form of the agreement included in this Project Manual.
5. Architect will review the BIM model to confirm that the Work is being coordinated, but not for the details of the coordination, which are CM@R's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform CM@R, who shall make changes as directed and resubmit.

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI. .

1. RFI's are to be submitted on the CM@R's web based Construction Management Software Platform
2. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of CM@R
6. Name of Architect
7. RFI number, numbered sequentially.
8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
13. Contractor's signature.
14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form on CM@R's web based construction managements software,

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's and Engineer's Action: CM@R will assign each RFI to the appropriate Architect. If the RFI needs to be addressed to and Engineer the RFI will be addressed to both to the Architect and the Engineer. The Architect will confirm the appropriate party for response has been identified and will bring necessary corrections to the CM@R's immediate attention after the initial review of the RFI. The appropriate party will review each RFI, determine action required, and respond. Allow seven working days for a response for to each RFI. The Architect is to approve or amend Engineering response before they are the official response.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

a. If CM@R or the subcontractor believes the RFI response warrants a change in the Contract Time or the Contract Sum, notify Architect in writing or within the CM@R's web based construction management software within **5** days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log. RFI log is to be managed on the CM@R's web based construction management software.

1. Project name.
2. Name and address of Contractor.
3. Name and address of CM@R.
4. Name and address of Architect
5. RFI number including RFIs that were returned without action or withdrawn.
6. RFI description.
7. Date the RFI was submitted.
8. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately update the web based construction management software to assure the information is promptly distributed to all parties. Review response and notify CM@R and Architect within five days if Contractor disagrees with response.

1.8 PROJECT MEETINGS

A. General: CM@R will schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: CM@R is to 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: CM@R is prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: CM@R will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: CM@R will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of CM@R, Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.

b. Phasing.
c. Critical work sequencing and long-lead items.
d. Designation of key personnel and their duties.
e. Lines of communications.
f. Procedures for processing field decisions and Change Orders.
g. Procedures for RFIs.
h. Procedures for testing and inspecting.
i. Procedures for processing Applications for Payment.
j. Distribution of the Contract Documents.
k. Submittal procedures.
l. Sustainable design requirements.
m. Preparation of record documents.
n. Use of the premises.
o. Work restrictions.
p. Working hours.
q. Owner's occupancy requirements.
r. Responsibility for temporary facilities and controls.
s. Procedures for moisture and mold control.
t. Procedures for disruptions and shutdowns.
u. Construction waste management and recycling.
v. Parking availability.
w. Office, work, and storage areas.
x. Equipment deliveries and priorities.
y. First aid.
z. Security.
aa. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Sustainable Design Coordination Conference: CM@R will schedule and conduct a sustainable design coordination conference before starting construction, at a time convenient to Owner, CM@R, Architect, and Contractor.

1. Attendees: Authorized representatives of Owner, CM@R, Architect, and their consultants; Contractor and its superintendent and sustainable design coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect meeting sustainable design requirements, including the following:

a. Sustainable design Project checklist.
b. General requirements for sustainable design-related procurement and documentation.
c. Project closeout requirements and sustainable design certification procedures.
d. Role of sustainable design coordinator.
e. Construction waste management.
f. Construction operations and sustainable design requirements and restrictions.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

D. Preinstallation Conferences: CM@R will 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 RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Sustainable design requirements.
    i. Review of mockups.
    j. Possible conflicts.
    k. Compatibility requirements.
    l. Time schedules.
    m. Weather limitations.
    n. Manufacturer's written instructions.
    o. Warranty requirements.
    p. Compatibility of materials.
    q. Acceptability of substrates.
    r. Temporary facilities and controls.
    s. Space and access limitations.
    t. Regulations of authorities having jurisdiction.
    u. Testing and inspecting requirements.
    v. Installation procedures.
    w. Coordination with other work.
    x. Required performance results.
    y. Protection of adjacent work.
    z. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

E. Project Closeout Conference: CM@R will schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, CM@R Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of record documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. Requirements for completing sustainable design documentation.
    e. Requirements for preparing operations and maintenance data.
    f. Requirements for delivery of material samples, attic stock, and spare parts.
    g. Requirements for demonstration and training.
    h. Preparation of Contractor's punch list.
    i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    j. Submittal procedures.
    k. Coordination of separate contracts.
    l. Owner's partial occupancy requirements.
    m. Installation of Owner's furniture, fixtures, and equipment.
    n. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

F. Progress Meetings: CM@R progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, CM@R and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Status of sustainable design documentation.
6) Deliveries.
7) Off-site fabrication.
8) Access.
9) Site utilization.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of 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.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

G. Coordination Meetings: CM@R will conduct project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, CM@R and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions

are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site utilization.
9) Temporary facilities and controls.
10) Work hours.
11) Hazards and risks.
12) Progress cleaning.
13) Quality and work standards.
14) Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

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. CM@R's Construction Schedule.
2. Daily construction reports.
3. Field condition reports.
4. 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 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.4 SUBMITTALS

A. CM@R;s Construction Schedule: Submit digital copy of initial schedule, large enough to show entire schedule for entire construction period.

B. Field Condition Reports: CM@R to submit digital copy immediately upon discovery of field condition differences.

C. Special Reports: CM@R to Immediately upon the occasion of an unusual event.

D. Sustainable Design Submittals: CM@R to submit reports and/or updates of material tracking and costs monthly with pay applications or as requested by the Architect.

1.5 COORDINATION

A. CM@R to coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. CM@R to coordinate Construction Schedule with the Schedule of Values, list of subcontracts, 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 CM@R's CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: CM@R to comply with procedures contained in AGC's "Construction Planning & Scheduling." CM@R to provide a schedule for each CCO and GMP for the owner's review and approval. Any modifications to the contract schedule will be accomplished through a change order after the GMP has been established.

B. Time Frame: CM@R to extend schedule from date established from the Notice to Proceed to date of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: CM@R to treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include appropriate times for start up and testing.
5. Sustainable Design Commissioning: Include appropriate times for Owner's commissioning activity as required for Sustainable Design Certification.
6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: CM@R to include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

2. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.
b. Submittals.
c. Purchases.
d. Fabrication.
e. Sample testing.
f. Deliveries.
g. Installation.

h. Tests and inspections.
i. Adjusting.
j. Curing.
k. Startup and placement into final use and operation.

3. Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Structural completion.
b. Permanent space enclosure.
c. Completion of mechanical installation.
d. Completion of electrical installation.
e. Substantial Completion.

E. Milestones: CM@R to include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Completion of each Major Activity and Substantial Completion.

F. Computer Software: CM@R to prepare schedules using a program that has been developed specifically to manage construction schedules.

2.2 REPORTS

A. Daily Construction Reports: CM@R to prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. Approximate count of personnel at Project site.
3. Equipment at Project site.
4. Material deliveries.
5. High and low temperatures and general weather conditions.
6. Accidents.
7. Meetings and significant decisions.
8. Unusual events (refer to special reports).
9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recordings.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Change Orders received and implemented.
14. Work Change Directives received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial Completions and occupancies.
18. Substantial Completions authorized.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, CM@R is to prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.3 SPECIAL REPORTS

A. General: CM@R is to submit special reports directly to Owner within one day 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, CM@R is to 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 CM@R'S CONSTRUCTION SCHEDULE

A. CM@R’s Construction Schedule Updating: At intervals that are appropriate and when requested by Architect when there is evidence of the construction being behind schedule, no more often than monthly, update schedule to reflect actual construction progress and activities. Issue schedule when it is updated at regularly scheduled progress meetings.

1. Submit a current Construction Schedule with the monthly Application for Payment if it has been updated since the previous Application for Payment.

B. Distribution: CM@R is to 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

SECTION 01 32 23 - SURVEY AND LAYOUT DATA

PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall provide construction stakeout sufficient to construct the proposed improvement in accordance with the approved construction plans.

B. All stakeout services shall be completed under the direct supervision of a Professional Land Surveyor licensed in the State where the project is located.

C. The Owner shall provide the following prior to the commencement of any stake-out services:
   1. Construction site drawings and associated electronic files.
   2. Copies of the topographic survey that the approved site plans have been based on. The topographic survey shall include at least one benchmark, which shall be used for vertical control; and,
   3. Copies of the boundary survey that the approved site plans have been based on. The boundary survey shall be closed and monumented/ironed. These monuments/irons shall be used for horizontal control related to the site boundary and the dimensional control plan.

D. Contractor shall verify existing grades prior to performing work under this section. If existing grades are at variance with the drawings, notify the Owner and receive instructions prior to proceeding. No additional compensation will be considered resulting from grade variances once site clearing has commenced.

E. Contractor is responsible for providing as-built survey documentation sealed by a licensed surveyor. Both PDF and Autocad format to be provided. An as-built survey must be completed prior to close-out of the project. The General Contractor must provide a survey in CAD format meeting the requirements below to the A&E prior to project closeout.

   Adhere to the requirements concerning submission of drawings in CAD format as indicated. All as-built surveys are to be produced in Auto CAD Civil 3D (version within one edition of current). All as-built surveys to include: as-built 3D surface model and as-built storm drainage and sanitary sewer systems to be in C3D pipe network. All BIM modeling shall be developed **per document referenced on Capital Projects webpage**. Consult with the Project Manager for additional information.

PART 2 - PRODUCTS

2.01 MATERIALS

A. The Contractor/Surveyor shall supply all stakeout materials.

2.02 EQUIPMENT

A. The Contractor/Surveyor shall supply all equipment necessary to accomplish the work.

PART 3 - EXECUTION

3.01 PERFORMANCE STANDARDS

A. Curb Layout
   1. Stakes shall be located at a minimum of 25 feet and a maximum of 50 feet intervals and also at points of curvature, points of tangency, radius points, and transitions, high and low points, and deflections. Offsets will be at 4 feet from face of curb, elevations to top of curb, elevations of top of curb to be provided at this 4 foot offset.

B. Storm and Sanitary Manholes
   1. 15 feet and 25 feet offset stakes in the same direction will be set from the centerline opening of structure lath. One offset stake will have an elevation to top of rim and inverts. Intermediate grade stakes to pipe invert elevation will be provided if needed.
      (Note: These stakes are not to conflict with piping.)
C. Catch Basins
   1. Set a centerline of structure lath with 10 foot offset HUB along the face of curb on either side of the lath at face of curb. One offset stake will have an elevation to top of grate and inverts.
      (Note: These stakes are not to conflict with piping.)
D. Utility Layout
   1. Water – Stakes shall be located at 50 foot intervals along centerline of pipe and at deflections with no offsets. One 10 foot offset stake to the center of hydrant with a grade ring elevation will be provided;
   2. Lighting – Centerline of lighting structure with a 5 foot offset will be staked. Offset stake elevation will be to finished grade; and,
   3. Centerline of pipes will be staked with no offset.
E. Roadway Layout
   1. Grade stakes shall be located at centerline of roadway at 50 foot intervals, including point of curvature, point on curve, point of tangency, and points of vertical curves. Grades shall be at finished grade.
F. Wall Layout
   1. Stakes with 10 feet offset shall be provided at 50 feet intervals, deflections, beginning and end of wall. Additional stakes may be required, depending on wall height and conditions.
G. Limits of Disturbance
   1. Clearing limits shall be staked at 100 feet ± intervals and at all critical areas.
H. Grade Stakes
   1. Stakes will be provided at a 50 foot grid. Grade elevations shall be to finished grade.

3.02 CONTRACTOR VERIFICATION
A. Contractor will field verify the utility location, size and invert elevations at points of connection in area of conflict, prior to construction and protect them from damage.
   1. Finished subgrades shall be verified by the Contractor to ensure proper elevation and conditions for construction above subgrade;
   2. Protect subgrade from excessive construction traffic and wheel loading including concrete and dump trucks; and,
B. Notify Owner if it is necessary to destroy or remove control points and/or benchmarks due to construction. Contractor shall be responsible for the protection of benchmarks, including the cost for relocation as required.
C. Advise Owner of any discrepancies between plans and field layout.

3.03 QUALITY ASSURANCE
A. The survey crew shall discuss all layout procedures with the Contractor's supervisor prior to commencing work.
B. A survey crew daily report detailing that day's work, shall be completed and signed by the Contractor's supervisor at the end of that day's layout.
C. Copies of sketches, cut sheets, etc. shall be provided to the Contractor by the beginning of the next workday.
D. All costs related to re-staking due to construction or Contractors' work resulting in destruction or movement of stakes, shall be paid for by the Contractor and at no additional expense to the Owner.

E. Building dimensions shall be obtained only from the approved architectural/structural drawings. Dimensions are to be obtained only from the appropriate approved (engineering, architectural and structural) drawings. The surveyor shall report any conflicts to the Contractor and Owner.

END OF SECTION 01 32 23

SECTION 01 32 33 - PHOTOGRAPHIC AND VIDEO DOCUMENTATION

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. Section includes administrative and procedural requirements for the following:

1. Photographic Documentation
2. Preconstruction Video Recording
3. Post Demolition Video Recording
4. Optional Periodic Video Recording

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For 360 video documentation service providers if not provided by CM@R.

B. Video Recordings: Submit video recordings within seven days of recording.

1. Submit video recordings by uploading to web-based Project management software site. Include copy of key plan indicating each video's location and direction.
2. Identification: With each submittal, provide the following information on web-based Project management software site:

a. Name of Project.
b. Name and address of photographer.
c. Name of Architect
d. Name of Contractor.
e. Date video recording was recorded.
f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

C. Sustainable Design Photographic Documentation: As required by Green Globes certification requirements, provide photographic documentation at appropriate intervals and/or as requested from the Architect, TIME and DATE STAMPED, depicting the protection of stormwater systems from on-site debris, the protection of on-site stored materials and the protection of all air intakes, supplies and exposed duct ends during construction.

D. Digital Photographs: Post image files to construction management software website within three days of taking photographs.

1. Digital Camera: Minimum sensor resolution of 8 megapixels.
2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
3. Identification: Provide the following information with each image description in file metadata tag:

    a. Date photograph was taken.
    b. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
    c. Unique sequential identifier keyed to accompanying key plan.

E. Photographic Documentation:

1. Provide (2) two digital copies of the entire Photographic Document at the end of the project.
2. To include all photographs taken with date taken, description of vantage point, and identifier keyed to accompanying key plan.

1.4 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

B. Web-Based Photographic Documentation Service Provider: A firm specializing in providing photographic equipment, Web-based software, and related services for construction projects, with record of providing satisfactory services similar to those required for Project.

1.5 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC AND VIDEO MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

A. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of **12** megapixels and capable of recording in full high-definition mode. Provide supplemental lighting in low light levels or backlit conditions.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS AND VIDEOS

A. 360 Video Documentation System of existing building conditions:

1. Pre-demolition Video Recording: Before demolition begins document the entire site and existing building.
2. Provide an electronic key plan of project site and building of path of 360 video indicating story of building along path. Provide software access to Architect and the Architect's consultant and to the Owner so they are be able to view the documentation freely.
3. Preconstruction Video Recording: After demolition is complete and before construction begins document the entire building for a second time.
4. Periodic Construction Video Recordings: At CM@R's option if video recording occurs periodically, make these videos available to the Owner and Architect. Select vantage points to show status of construction and progress since last video recordings were recorded.

B. Photographer: Engage a qualified photographer to take construction photographs.

C. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

D. Digital Images and Videos: Post digital images and videos exactly as originally recorded without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.

E. Photographic Requirements: Comply with CM@R's requirements for quantity and location of photographs to be taken during the following phases of construction:

1. Preconstruction Photos
2. Before commencement of excavation and demolition.
3. Periodic Construction Photos
4. Final Completion Photo

3.2 ON-LINE WEB HOSTING OF PHOTOGRAPHIC AND VIDEO DOCUMENTATION

A. On-line Web Hosting of Photographic Documentation on CM@R's Construction Management Platform: To include all videos and photographs taken with date taken, description of vantage point, and identifier keyed to accompanying key plan.

1. Link each photo set to the appropriate location on the site plan.
2. Provide on-line hosting on a website for the duration of the construction period that is accessible from anywhere internet is accessible.
3. Password protect access to the documentation and share password with project team.
4. Identification of the Project:

    a. Name of Project.
    b. Name and contact information for photographer.
    c. Name of CM@R
    d. Name of Architect
    e. Name of Contractor.

5. Identification for each Photograph: Provide the following information:

    a. Date(s) and time(s) video recording was recorded.
    b. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
    c. Weather conditions at time of recording.

END OF SECTION 01 32 33

SECTION 01 33 00 - SUBMITTAL PROCEDURES

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.
5. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
6. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires 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.

C. Sustainable Submittals: In conjunction with required product submittals, provide Sustainable materials submittals detailing the contribution of all materials to the Sustainable certification process, including but not limited to all adhesives, sealants, paints, coatings, architectural and construction adhesives, recycled and regional materials, agrifiber and composite wood products and all other materials as detailed in the individual product specifications.

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals under the conditions and procedures indicated 010070 Special Conditions.

B. Electronic Submittal Process: Submittal to be submitted and processed on and through the CM@R's Construction Management Software Platform.

C. 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.

D. 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 10 working 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 5 working days for review of each resubmittal.
4. Concurrent Review: The following groups of submittals and samples are to be reviewed concurrently. The review period begins after all concurrent submittals have been received. Submittals are to include all submittals in these groups.
   a. Electrical Site Utilities
   b. Mechanical Site Utilities
   c. Fire Protection Site Utilities
   d. Storm Water and Sewage Site Utilities

E. 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 4 by 6 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. Submittal number or other unique identifier, including revision identifier.
i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Other necessary identification.

F. Deviations: Cloud and note or otherwise specifically identify deviations from the Contract Documents on submittals.

G. 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.

1. Additional copies submitted for maintenance manuals will not be marked with action taken and will not be returned.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form containing the following information. Architect will return submittals without review received from sources other than Contractor.

1. 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.

2. Record and identify 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.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "No Exceptions Taken or Make Corrections Noted"

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals clearly marked with Architect's submittal action stamp indicating the action indicated to be taken by Contractor and the Architect's signature and date on the submittal stamp.

1.5 CONTRACTOR'S USE OF ARCHITECT'S DIGITAL FILES

A. General: At Contractor's written request, copies of Architect's digital files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

1. See Section 010070 Special Conditions.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

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.
5. Number of Copies: Submit product data electronically with CM@R's construction management software in accordance with CM@R's requirements.

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, unless submittal of Architect's Drawings are otherwise permitted.

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 (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
3. Number of Copies: Submit shop drawings electronically with CM@R's construction management software in accordance with CM@R's requirements. Architect will return one copy of the marked up shop drawings electronically.

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: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one 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: Submit two sets of Samples. Architect will retain one Sample sets; and will return one sample set.

        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. Contractor's Construction Schedule: In accordance with 3.59 of OSE FORM 00811 Standard Supplementary Conditions, the CM@R shall submit a current construction schedule with the monthly Application for Payment.

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

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

H. Subcontract List: The CM@R is to 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 two copies of subcontractor list, unless otherwise indicated. Architect will return one copy.

    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 information submittals electronically with CM@R's construction management software in accordance with CM@R's requirements.
2. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

C. 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.

D. 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.

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

F. 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.

G. 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.

H. 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."

I. 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.

J. 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.

K. 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.

L. 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.

M. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

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 four copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CM@R's REVIEW

A. The CM@R is to 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: The CM@R is to 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: The Architect will return to the contractor without examination shop drawings, product data and other required submittals, which have not been prepared according to contract requirements. 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
2. Make Corrections Noted
3. Revise and Resubmit
4. Rejected

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

SECTION 01 40 00 - QUALITY REQUIREMENTS

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 quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:

1. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
2. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 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.

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.

1.4 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.

1.5 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. 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. Record of temperature and weather 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.

C. 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.

1.6 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. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through 49.

1.7 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 types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made by the owner.
3. 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 the Contractor.

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

D. 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. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

E. 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. Preliminary design mix proposed for use for material mixes that require control by testing agency.
6. Security and protection for samples and for testing and inspecting equipment at Project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."

B. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 41 00 - SPECIAL INSPECTIONS AND TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for special inspections.

B. Special inspection 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.

C. The owner will hire a Special Inspections firm to perform special inspections testing and monitoring, and is to submit reports and other items indicated in this specification section unless noted otherwise. Contractor is to cooperate with owner's testing agency and is to allow they appropriate level of access to the work. Refer to Quality Control section of this specification.

D. Related Sections include the following:

1. Division 1 Section "Quality Requirements" for other quality assurance and quality control requirements not indicated in this Section.
2. Divisions 2 through 33 Sections for specific and additional requirements.

1.2 SUBMITTALS

A. 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 inspecting agency.
4. Dates and locations of inspections.
5. Names of individuals making inspections.
6. Description of the Work 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 results.
10. Record of temperature and weather 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 inspector.
13. Recommendations on retesting and reinspecting.

B. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

A. Statement of Special Inspections: Per 2018 IBC Section 1704.3.1

1. Content of Statement of Special Inspections:
   a. The materials, systems, components and work required to have special inspections has been determined by the registered design professional of responsible charge as identified in this specification section.

2. Type and Content of each Special Inspection and Testing:

   a. Refer to Schedule of Special Inspections provided in this specification section.

3. The type and frequency of Special Inspections required are also listed on the Schedule of Special Inspections included at the end of this Section. Refer to the indicated specification reference for additional detail including whether each type of special inspection is periodic or continuous.

4. Testing and Special Inspections Reports shall be prepared on a weekly basis and shall contain copies of all Daily Reports, Discrepancy Notices, and any other reports as described in section 1.2.A above. The Weekly report shall be distributed to the following parties:
   a. Clemson University Project Manager: Al Cope
   b. Architect of Record: The Boudreaux Group
   c. Construction Manager at Risk: Juneau Construction Company

B. Statement of Special Inspections for Seismic Resistance: Per 2018 IBC Sections 1704.3.2.

1. Seismic Category C

2. The Special Inspections for the seismic force resisting systems for this Project are listed on the Schedule of Special Inspections included at the end of this Section. Refer to the indicated specification reference for additional detail including whether each type of special inspection is periodic or continuous.

3. Testing:
   a. Submit certificates of compliance as required in Submittal paragraphs listed in specification reference column of "Schedule of Special Inspections".

4. The type and frequency of Special Inspections required are listed on the Schedule of Special Inspections included at the end of this Section.

5. Testing and Special Inspections Reports shall be prepared on a weekly basis and shall contain copies of all Daily Reports, Discrepancy Notices, and any other reports as described in section 1.2.A above. The Weekly report shall be distributed to the following parties:
   a. Clemson University: Project Manager, Al Cope.
   b. Architect of Record: The Boudreaux Group
   c. Construction Manager at Risk: Juneau Construction Company

d. Structural Engineer of Record: Michael M. Simpson + Associates
e. Mechanical Engineer of Record: Swygert & Associates
f. Electrical Engineer of Record: Belka Engineering Assoc.
g. Civil Engineer of Record: Land Planning Associates, Inc.
h. Authority Having Jurisdiction: The Office of State Engineer, Jim McVey.

6. An architect from The Boudreaux Group will perform regular observations of the construction progress for general conformance with the Contract Documents.
7. An Engineer from Swygert & Associates will perform observations of the mechanical and plumbing systems for general conformance with the Contract Documents at significant construction stages and at completion of the Project.
8. An Engineer from Belka Engineering Associates will perform observations of the electrical systems for general conformance with the Contract Documents at significant construction stages and at completion of the Project.
9. A report of each observation will be prepared and distributed to the Architect for distribution to the Contractor, and Owner and Special Inspections Testing Agency.

1.4 QUALITY CONTROL

A. Responsibilities:

1. Owner: Pay for initial services indicated in this Section.
2. Contractor: Responsible for the cost of retesting and re-inspecting services, if initial services failed to comply with the Contract Documents. Cost of retesting and re-inspecting services will be held from the Contractor's monthly pay application.

B. Refer to Division 1 Section "Quality Requirements" for other quality assurance and quality control requirements not indicated in this Section.

C. Associated Services: Contractor to cooperate with personnel performing required inspections and provide reasonable auxiliary services as requested. 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.

D. Coordination: Contractor to coordinate sequence of activities to accommodate required special inspections with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Statement of Special Inspections: As indicated at end of this Section.
2. Schedule of Special Inspection Services: As indicated at end of this Section.

1.5 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by the qualified special inspector or agency indicated, as required by authorities having jurisdiction, and as indicated in Schedule of Special Inspection Services at end of this Section.

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.

C. Refer to Division 1 Section "Quality Requirements" for other tests and inspections not indicated in this Section.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, and similar services, repair damaged construction and restore substrates and finishes.

   1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
   2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility.

STATEMENT OF SPECIAL INSPECTIONS

PROJECT NAME: Clemson University, Bryan Mall High Rises Renovation, Byrnes Hall

CONTRACTOR/ARCHITECT/ENGINEER: Juneau Construction Company /The Boudreaux Group/, Swygert & Associates, Belka Engineering Assoc., Michael M. Simpson + Associates, Land Planning Associates, Inc.

The following firms and/or individuals are designated to perform the Special Inspections of the material or work designated below. The firms and /or individuals have the experience, qualifications, certifications and/or licenses required to perform the Special Inspections indicated.

Material/Work to be Inspected: **All Special Inspections**

Firm/Individual Name: To Be Determined

Responsibilities of the special inspectors are indicated on the attached **Schedule of Special Inspections.** Discrepancies shall be brought to the immediate attention of the Contractor so that corrective action can be taken in a timely manner. Copies of all test reports and test data shall be obtained from the inspectors by the A/E on a timely basis.

The Boudreaux Group; Robert Randall Huth, AIA, Executive Vice President
(Print or Type Name of A/E Representative)

December 20, 2023
(Signature) *(Date)*

SCHEDULE OF SPECIAL INSPECTIONS AND TESTING
Under the Provisions Section 1704 of 2018 IBC, and Chapter 1 of the 2018 IBC, and for Miscellaneous Areas

Project Name: Clemson University, Bryan Mall High Rises Renovation, Byrnes Hall

FABRICATORS (IBC 1704.2.5.1)

☐ Approved Fabricator N/A	Yes	No

☐ Approved Fabricator	Yes	No

IF CERTIFIED STEEL FABRICATION SHOP, FILL IN BELOW:

Fabricators Name:	
Fabricators Plant Location:	

Required in-plant Inspections ☒ Steel Construction ☒ Welding ☒ Details

STEEL (IBC 1705.2, AISC 360 & AWS)

Item			Detailed Instructions and Frequencies
High Strength Bolting	☐ Continuous	☒ Periodic	Inspect 20%
WELDING	☐ Continuous	☐ Periodic	N/A
Complete & partial penetration groove welds	☒ Continuous	☐ Periodic	
Multi-pass fillet welds	☐ Continuous	☐ Periodic	N/A
Single-pass fillet welds >5/16”	☐ Continuous	☐ Periodic	N/A
Single-pass fillet welds ≤5/16”	☐ Continuous	☒ Periodic	Visually inspect 50%
Diagonal bracing welds	☒ Continuous	☐ Periodic	N/A
Floor & roof deck and acoustical deck connection	☐ Continuous	☒ Periodic	
REINFORCEMENT STEEL	☐ Continuous	☐ Periodic	N/A
Verification of weldability	☐ Continuous	☐ Periodic	N/A
Shear wall and shear reinforcement	☐ Continuous	☐ Periodic	N/A
Other reinforcement	☐ Continuous	☐ Periodic	N/A
Steel frame joint details	☐ Continuous	☒ Periodic	N/A
Light gage wall and truss framing member sizes and connections	☐ Continuous	☒ Periodic	

CONCRETE CONSTRUCTION (IBC 1705.3)

Item			Detailed Instructions and Frequencies
Materials (1705.3.2)	☒ Continuous	☐ Periodic	
Steel placement	☐ Continuous	☒ Periodic	
Steel welding	☐ Continuous	☐ Periodic	N/A
Bolts prior & during placement	☒ Continuous	☐ Periodic	
Use of required design mix	☒ Continuous	☐ Periodic	
Concrete sampling for strength test, slump, air content, and temperature of concrete	☒ Continuous	☐ Periodic	
Concrete placement	☒ Continuous	☐ Periodic	
Curing temperature and techniques	☐ Continuous	☒ Periodic	

Pre-stressed concrete	☐ Continuous	☐ Periodic	N/A
Pre-cast concrete	☐ Continuous	☐ Periodic	N/A
Posttensioned concrete	☐ Continuous	☐ Periodic	N/A
Form work	Continuous	☒ Periodic	

MASONRY CONSTRUCTION (IBC 1705.4)

Item			Detailed Instructions and Frequencies
As masonry construction begins:	**Also refer to Specification Section 042000 Unit Masonry**		
Site prepared mortar	☐ Continuous	☒ Periodic	Twice each week.
Construction of mortar joints	☐ Continuous	☒ Periodic	Twice each week.
Location of reinforcement, connectors, pre-stressing tendons and anchorages	☐ Continuous	☒ Periodic	
Pre-stressing technique	☐ Continuous	☐ Periodic	N/A
Grade and size of pre-stressing tendons and anchorages	☐ Continuous	☐ Periodic	N/A
Inspection program verify:			
Size and location of structural elements	☐ Continuous	☒ Periodic	Twice each week.
Type, size and location of anchors	☐ Continuous	☒ Periodic	Twice each week.
Size, grade and type of reinforcement	☐ Continuous	☒ Periodic	Twice each week.
Welding of reinforcement	☐ Continuous	☐ Periodic	N/A
Cold and hot weather protection	☐ Continuous	☒ Periodic	
Application and measurement of pre-stressing force	☐ Continuous	☐ Periodic	N/A
Prior to grouting verify:			
Clean grout space	☐ Continuous	☒ Periodic	Before each pour.
Placement of reinforcement	☐ Continuous	☒ Periodic	Before each pour.
Grout mix	☐ Continuous	☒ Periodic	Verify site mixed proportions are in accordance with ASTM C 476
Mortar joints	☐ Continuous	☒ Periodic	Twice each week, periodic observation of mortar batching for correct and consistent procedure.
Grout placement	☐ Continuous	☒ Periodic	
Grout specimens and prisms	☐ Continuous	☒ Periodic	Each day's pour.
Construction and submittal compliance verification	☐ Continuous	☒ Periodic	
Empirical masonry – Cat. I-III (1705.4.1)	☐ Continuous	☐ Periodic	N/A
Empirical masonry – Cat. IV (1705.4.1)	☐ Continuous	☐ Periodic	N/A
Engineered masonry – Cat. I-III (1705.4.1)	☐ Continuous	☒ Periodic	
Engineered masonry – Cat. IV (1705.4.1)	☐ Continuous	☐ Periodic	N/A
Engineering & pre-stressing steel (1708.3)	☐ Continuous	☐ Periodic	N/A

Non-structural component	☐ Continuous	☒ Periodic	Masonry Veneer – mortar cavity cleanliness, anchoring spacing, overall procedure. Periodic.
Qualification of mechanical & electrical equipment (1705.12.6)	☐ Continuous	☐ Periodic	N/A
Seismically isolated structures (1705.12.8)	☐ Continuous	☐ Periodic	N/A
Testing for seismic resistance is	☐ Continuous	☐ Periodic	N/A

WOOD CONSTRUCTION (IBC 1705.5)

Item			Detailed Instructions and Frequencies
Prefabricated elements & assembly	☐ Continuous	☐Periodic	N/A
Wood roof sheathing nailing	☐ Continuous	☐ Periodic	N/A
Anchorage and blocking of wood roof framing	☐ Continuous	☐ Periodic	N/A

SOILS CONSTRUCTION (IBC 1705.6)

Item			Detailed Instructions and Frequencies
Site preparation	☐ Continuous	☐ Periodic	N/A
Site fill material	☒ Continuous	☐ Periodic	See Spec. Section 31 20 00 Earth Moving
Site fill lift thickness	☒ Continuous	☐ Periodic	See Spec. Section 31 20 00 Earth Moving
Site fill soil densities	☒ Continuous	☐ Periodic	See Spec. Section 31 20 00 Earth Moving
Backfill soils materials	☒ Continuous	☐ Periodic	See Spec. Section 31 20 00 Earth Moving
Backfill soil densities	☒ Continuous	☐ Periodic	See Spec. Section 31 20 00 Earth Moving
Footing Bottoms	☒ Continuous	☐ Periodic	

PIER FOUNDATIONS (IBC 1705.7 through 1705.9)

Driven Deep Foundations IBC 1705.7

Item			Detailed Instructions and Frequencies
Verify element materials, sizes and lengths comply with the requirements	☐ Continuous	☒ Periodic	
Determine capacities of test elements and conduct additional load tests, as required.	☒ Continuous	☐ Periodic	
Inspect driving operations and maintain complete and accurate records for each element.	☒ Continuous	☐ Periodic	
Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document and damage to foundation element.	☐ Continuous	☒ Periodic	
For steel elements and concrete-filled elements, perform test and additional special inspections in	☐ Continuous	☐ Periodic	N/A

accordance with Section 1705.2			
For concrete elements and concrete filled-filled elements, perform tests and additional special inspections in accordance with Section 1705.3	☐ Continuous	☒ Periodic	
Perform additional inspections as determined by the registered design professional in responsible charge.	☐ Continuous	☒ Periodic	In accordance with construction documents

SPECIAL INSPECTIONS FOR WIND RESISTANCE (IBC 1705.11)

Item			Detailed Instructions and Frequencies
Structural Wood	☐ Continuous	☐ Periodic	N/A
Cold-formed steel light-frame construction	☐ Continuous	☒ Periodic	
Wind-resisting components	☐ Continuous	☐ Periodic	N/A

SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE (IBC 1705.12)

Item			Detailed Instructions and Frequencies
Structural Steel	☐ Continuous	☒ Periodic	
Structural Wood	☐ Continuous	☐ Periodic	N/A
Cold-formed steel light-framed construction	☐ Continuous	☒ Periodic	
Designated Seismic System	☐ Continuous	☐ Periodic	N/A
Architectural Components	☐ Continuous	☒ Periodic	Seismic Class C
Mechanical and Electrical Components	☐ Continuous	☒ Periodic	Anchorage of electrical equipment for emergency and standby power systems – Seismic Class C
Storage racks	☐ Continuous	☐ Periodic	N/A
Seismic Isolation Systems	☐ Continuous	☐ Periodic	N/A

TESTING AND QUALIFICATION FOR SEISMIC RESISTANCE (IBC 1705.13)

Item			Detailed Instructions and Frequencies
Concrete Reinforcement	☐ Continuous	☐ Periodic	N/A
Structural Steel	☐ Continuous	☐ Periodic	N/A
Seismic Certification of nonstructural components	☐ Continuous	☐ Periodic	N/A

SPRAYED FIRE-RESISTANT MATERIALS (IBC 1705.14)

Item			Detailed Instructions and Frequencies
Structural member surface conditions	☐ Continuous	☒ Periodic	Prior to installation
Material application	☐ Continuous	☒ Periodic	After rough-in of electrical, mechanical, sprinkler, plumbing and ceiling suspension systems

Material thickness	☐ Continuous	☒ Periodic	After rough-in of electrical, mechanical, sprinkler, plumbing and ceiling suspension systems
Material density	☐ Continuous	☒ Periodic	After rough-in of electrical, mechanical, sprinkler, plumbing and ceiling suspension systems
Bonding strength	☐ Continuous	☒ Periodic	After rough-in of electrical, mechanical, sprinkler, plumbing and ceiling suspension systems

MASTIC AND INTUMESCENT FIRE-RESISTANT COATINGS (IBC 1705.15)

Item			Detailed Instructions and Frequencies
Material and installation	☐ Continuous	☒ Periodic	Prior to installation, three times a week as work progresses, after installation

DIRECT APPLIED EXTERIOR FINISH SYSTEM (DEFS) AND STUCCO (IBC 1705.16)

Item			Detailed Instructions and Frequencies
DEFS Material and installation	☐ Continuous	☒ Periodic	Three times a week as work progresses
Water-resistive barrier coating	☐ Continuous	☒ Periodic	Before Stucco is installed.

FIRE-RESISTANT PENETRATIONS AND JOINTS (IBC 1705.17)

Item			Detailed Instructions and Frequencies
Penetration Firestops	☐ Continuous	☒ Periodic	See specification section 07 84 13
Fire-Resistant joint systems	☐ Continuous	☒ Periodic	See specification section 07 92 00

SMOKE CONTROL (IBC 1705.18)

Item			Detailed Instructions and Frequencies
Material	☐ Continuous	☐ Periodic	N/A
Installation	☐ Continuous	☐ Periodic	N/A

MISCELLANEOUS AREAS

Item			Detailed Instructions and Frequencies
These inspections are recommended by the Architect/Engineer			
Suspended Ceiling Grid Clips	☐ Continuous	☒ Periodic	Weekly.
Suspended Ceiling wire spacing	☐ Continuous	☐ Periodic	N/A
Soils backfill (specify locations and frequency)	☒ Continuous	☐ Periodic	See Spec. Section 31 20 00 Earth Moving
Soils for curb and gutter (specify locations and frequency)	☐ Continuous	☒ Periodic	See Spec. Section 31 20 00 Earth Moving
Soils for parking lots (specify locations and frequency)	☐ Continuous	☐ Periodic	N/A
Soils for utility trench backfill	☒ Continuous	☐ Periodic	See Spec. Section 31 20 00 Earth Moving
Reinforcement for slab on grade sidewalks and drive approaches (specify locations and frequency)	☒ Continuous	☐ Periodic	See Spec. Section 32 13 73 Concrete Paving
Reinforcement for interior slab on grade (specify locations and frequency)	☐ Continuous	☒ Periodic	Prior to concrete pour.
Concrete testing for slab on grade	☐ Continuous	☒ Periodic	Refer to “Concrete Construction” section of this

sidewalks and drive approaches (specify locations and frequency)			schedule
Concrete testing for interior slab on grade (specify locations and frequency)	☐ Continuous	☒ Periodic	Refer to "Concrete Construction" section of this schedule
Masonry Veneer (specify locations and frequency)	☐ Continuous	☒ Periodic	See "Masonry Construction" section of this schedule.
Gypsum Board Inspections. Inspection of gypsum board at fire rated assemblies	☐ Continuous	☒ Periodic	Check for Compliance with UL Fire Rated Assemblies indicated on drawings.
Fire Resistance Penetration Inspection. Inspection of joint and penetration protection required by IBC 712 and IBC 713.	☐ Continuous	☒ Periodic	Check for Compliance with UL Fire Rated Assemblies indicated on drawings.
Asphalt inspection (specify locations and frequency)	☐ Continuous	☒ Periodic	Refer to Specification Section 32 12 16 Asphalt Paving
Asphalt testing (specify locations and frequency)	☐ Continuous	☐ Periodic	N/A
Inspection of seismic resistance (specify locations and frequency)	☐ Continuous	☐ Periodic	N/A
Steam and water line welding (specify locations and frequency)	☐ Continuous	☐ Periodic	N/A
Seismic supports for duct work	☐ Continuous	☒ Periodic	See Spec. Section 23 05 48
Seismic supports for electrical raceways, cable trays and lights	☐ Continuous	☐ Periodic	N/A
Seismic supports for plumbing lines including gas.	☐ Continuous	☐ Periodic	N/A
Seismic bracing for mechanical units both on slab and suspended	☐ Continuous	☒ Periodic	See Spec. Section 23 05 48
Energy Efficiency Inspection. Inspection to determine compliance with IBC Chapter 13	☐ Continuous	☒ Periodic	Per 2018 International Mechanical Code Section 107.2
Energy Efficiency. Envelope Insulation R-Value	☐ Continuous	☐ Periodic	N/A
Energy Efficiency. Fenestration U-Value	☐ Continuous	☐ Periodic	N/A
Energy Efficiency. Duct System R-Value and sealing of joints for duct work	☐ Continuous	☐ Periodic	
Energy Efficiency. HVAC & Water Heating Equipment Efficiency	☐ Continuous	☒ Periodic	
Plumbing Inspections: Underground inspection after trenches or ditches are excavated and piping installed prior to backfill.	☐ Continuous	☒ Periodic	Per International Plumbing Code Section 107.2.1
Plumbing Inspections: Rough-in inspection prior to wall or ceiling membranes	☐ Continuous	☒ Periodic	Per International Plumbing Code Section 107.2.2
Plumbing Inspections: Final inspection after all fixtures are in place and connected	☐ Continuous	☒ Periodic	Per International Plumbing Code Section 107.2.3
Mechanical Inspections: Rough-in inspection prior to	☐ Continuous	☒ Periodic	Per International Mechanical Code Section 107.2

ceiling membranes			
Mechanical Inspections: Final inspection after all equipment and systems are in place	☐ Continuous	☒ Periodic	Per International Mechanical Code Section 107.2
Electrical Inspections: Underground inspection after trenches or ditches are excavated and piping installed prior to backfill.	☐ Continuous	☒ Periodic	See Spec. Section 26 05 33
Electrical Inspections: Rough-in inspections prior to wall or ceiling membranes	☐ Continuous	☒ Periodic	See Spec. Section 26 05 33
Electrical Inspections: Lighting Control Systems	☐ Continuous	☒ Periodic	See Spec. Section 26 09 23
Electrical Inspections: Inspection of label and anchorage of electrical equipment	☐ Continuous	☒ Periodic	See Spec. Section 26 05 53

Special Inspectors shall:

1. Perform the inspection and testing work indicated in the schedule of special inspections and testing schedule
2. Special inspectors with a statewide inspection/testing contract are approved to perform the work.
3. Special inspectors to be licensed with the International Code Council, ICC.
4. Inspection reports are to meet the requirements of IBC 2021 1704.2.4
5. Inspection reports are to be submitted to the engineer, architect and project manager within 72 hours of inspections;
6. A final inspection report shall be submitted following completion of the project documenting the types of special inspections performed and a statement indicating that the structure is in compliance with drawings, specifications and applicable codes. IBC 2021 1704.2.4
7. Complete Attached SE-962 Statement of Special Inspections Responsibilities

END OF SECTION 01 41 00

SECTION 01 42 00 - REFERENCES

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 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms, including "requested," "authorized," "selected," "required," and "permitted," have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms, including "shown," "noted," "scheduled," and "specified," have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 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.

1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations, List: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; (see FGIA).
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; www.concrete.org.
9. ACP - American Clean Power; (Formerly: American Wind Energy Association); www.cleanpower.org.
10. ACPA - American Concrete Pipe Association; www.concretepipe.org.
11. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
12. AF&PA - American Forest & Paper Association; www.afandpa.org.
13. AGA - American Gas Association; www.aga.org.
14. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
15. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
16. AI - Asphalt Institute; www.asphaltinstitute.org.
17. AIA - American Institute of Architects (The); www.aia.org.
18. AISC - American Institute of Steel Construction; www.aisc.org.
19. AISI - American Iron and Steel Institute; www.steel.org.
20. AITC - American Institute of Timber Construction; (see PLIB).
21. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
22. AMPP - Association for Materials Protection and Performance; www.ampp.org.
23. ANSI - American National Standards Institute; www.ansi.org.
24. AOSA/SCST - Association of Official Seed Analysts (The)/Society of Commercial Seed Technologists (The); www.analyzeseeds.com.
25. APA - APA - The Engineered Wood Association; www.apawood.org.
26. APA - Architectural Precast Association; www.archprecast.org.

27. API - American Petroleum Institute; www.api.org.
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASA - Acoustical Society of America; www.acousticalsociety.org.
30. ASCE - American Society of Civil Engineers; www.asce.org.
31. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (see ASCE).
32. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
33. ASME - ASME International; [**American Society of Mechanical Engineers (The)**]; www.asme.org.
34. ASSE - ASSE International; (American Society of Sanitary Engineering); www.asse-plumbing.org.
35. ASSP - American Society of Safety Professionals; www.assp.org.
36. ASTM - ASTM International; www.astm.org.
37. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
38. AVIXA - Audiovisual and Integrated Experience Association; www.avixa.org.
39. AWI - Architectural Woodwork Institute; www.awinet.org.
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
41. AWPA - American Wood Protection Association; www.awpa.com.
42. AWS - American Welding Society; www.aws.org.
43. AWWA - American Water Works Association; www.awwa.org.
44. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
45. BIA - Brick Industry Association (The); www.gobrick.com.
46. BICSI - BICSI, Inc.; www.bicsi.org.
47. BIFMA - Business and Institutional Furniture Manufacturer's Association; www.bifma.org.
48. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
49. BWF - Badminton World Federation; www.bwfbadminton.com.
50. CARB - California Air Resources Board; www.arb.ca.gov.
51. CDA - Copper Development Association Inc.; www.copper.org.
52. CE - Conformite Europeenne (European Commission); www.ec.europa.eu/growth/single-market/ce-marking.
53. CEA - Canadian Electricity Association; www.electricity.ca.
54. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
55. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
56. CGA - Compressed Gas Association; www.cganet.com.
57. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
58. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
59. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
60. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
61. CPA - Composite Panel Association; www.compositepanel.org.
62. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
63. CRRC - Cool Roof Rating Council; www.coolroofs.org.
64. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
65. CSA - CSA Group; www.csagroup.org.
66. CSI - Cast Stone Institute; www.caststone.org.
67. CSI - Construction Specifications Institute (The); www.csiresources.org.
68. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
69. CTA - Consumer Technology Association; www.cta.tech.

70. CTI - Cooling Technology Institute; www.coolingtechnology.org.
71. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
72. DHA - Decorative Hardwoods Association; www.decorativehardwoods.org.
73. DHI - Door and Hardware Institute; www.dhi.org.
74. ECIA - Electronic Components Industry Association; www.ecianow.org.
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. EOS/ESD - EOS/ESD Association, Inc.; Electrostatic Discharge Association; www.esda.org.
78. ESTA - Entertainment Services and Technology Association; www.esta.org.
79. EVO - Efficiency Valuation Organization; www.evo-world.org.
80. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
81. FGIA - Fenestration and Glazing Industry Alliance; https://fgiaonline.org.
82. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
83. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
84. FM Approvals - FM Approvals LLC; www.fmapprovals.com.
85. FM Global - FM Global; www.fmglobal.com.
86. FRSA - Florida Roofing and Sheet Metal Contractors Association, Inc.; www.floridaroof.com.
87. FSA - Fluid Sealing Association; www.fluidsealing.com.
88. FSC - Forest Stewardship Council U.S.; www.fscus.org.
89. GA - Gypsum Association; www.gypsum.org.
90. GS - Green Seal; www.greenseal.org.
91. HI - Hydraulic Institute; www.pumps.org.
92. HMMA - Hollow Metal Manufacturers Association; (see NAAMM).
93. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
94. IAS - International Accreditation Service; www.iasonline.org.
95. ICC - International Code Council; www.iccsafe.org.
96. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
97. ICPA - International Cast Polymer Association (The); www.theicpa.com.
98. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
99. IEC - International Electrotechnical Commission; www.iec.ch.
100. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
101. IES - Illuminating Engineering Society; www.ies.org.
102. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
103. IGMA - Insulating Glass Manufacturers Alliance; (see FGIA).
104. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.org.
105. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
106. Intertek - Intertek Group; www.intertek.com.
107. ISA - International Society of Automation (The); www.isa.org.
108. ISFA - International Surface Fabricators Association; www.isfanow.org.
109. ISO - International Organization for Standardization; www.iso.org.
110. ITU - International Telecommunication Union; www.itu.int.
111. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
112. LPI - Lightning Protection Institute; www.lightning.org.
113. MBMA - Metal Building Manufacturers Association; www.mbma.com.
114. MCA - Metal Construction Association; www.metalconstruction.org.
115. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.

116. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
117. MHI - Material Handling Industry; www.mhi.org.
118. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
119. MPI - Master Painters Institute; www.paintinfo.com.
120. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry, Inc.; www.msshq.org.
121. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
122. NACE - NACE International; (National Association of Corrosion Engineers International); (see AMPP).
123. NADCA - National Air Duct Cleaners Association; www.nadca.com.
124. NAIMA - North American Insulation Manufacturers Association; www.insulationinstitute.org.
125. NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
126. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
127. NBI - New Buildings Institute; www.newbuildings.org.
128. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
129. NCMA - National Concrete Masonry Association; www.ncma.org.
130. NEBB - National Environmental Balancing Bureau; www.nebb.org.
131. NECA - National Electrical Contractors Association; www.necanet.org.
132. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
133. NEMA - National Electrical Manufacturers Association; www.nema.org.
134. NETA - InterNational Electrical Testing Association; www.netaworld.org.
135. NFHS - National Federation of State High School Associations; www.nfhs.org.
136. NFPA - National Fire Protection Association; www.nfpa.org.
137. NFPA - NFPA International; (see NFPA).
138. NFRC - National Fenestration Rating Council; www.nfrc.org.
139. NGA - National Glass Association; www.glass.org.
140. NHLA - National Hardwood Lumber Association; www.nhla.com.
141. NLGA - National Lumber Grades Authority; www.nlga.org.
142. NOFMA - National Oak Flooring Manufacturers Association; (see NWFA).
143. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
144. NRCA - National Roofing Contractors Association; www.nrca.net.
145. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
146. NSF - NSF International; www.nsf.org.
147. NSI - Natural Stone Institute; www.naturalstoneinstitute.org.
148. NSPE - National Society of Professional Engineers; www.nspe.org.
149. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
150. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
151. NWFA - National Wood Flooring Association; www.nwfa.org.
152. NWRA - National Waste & Recycling Association; www.wasterecycling.org.
153. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
154. PDI - Plumbing & Drainage Institute; www.pdionline.org.
155. PLASA - PLASA; www.plasa.org.
156. PLIB - Pacific Lumber Inspection Bureau; www.plib.org.
157. PVCPA - Uni-Bell PVC Pipe Association; www.uni-bell.org.
158. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
159. RFCI - Resilient Floor Covering Institute; www.rfci.com.
160. RIS - Redwood Inspection Service; (see WWPA).

161. SAE - SAE International; www.sae.org.
162. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
163. SDI - Steel Deck Institute; www.sdi.org.
164. SDI - Steel Door Institute; www.steeldoor.org.
165. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
166. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (see ASCE).
167. SIA - Security Industry Association; www.securityindustry.org.
168. SJI - Steel Joist Institute; www.steeljoist.org.
169. SMA - Screen Manufacturers Association; www.smainfo.org.
170. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
171. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
172. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
173. SPIB - Southern Pine Inspection Bureau; www.spib.org.
174. SPRI - Single Ply Roofing Industry; www.spri.org.
175. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
176. SSINA - Specialty Steel Industry of North America; www.ssina.com.
177. SSPC - SSPC: The Society for Protective Coatings; (see AMPP).
178. STI/SPFA - Steel Tank Institute/Steel Plate Fabricators Association; www.steeltank.com.
179. SWI - Steel Window Institute; www.steelwindows.com.
180. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
181. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
182. TCNA - Tile Council of North America, Inc.; www.tcnatile.com.
183. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.kbcdco.tema.org.
184. TIA - Telecommunications Industry Association (The); www.tiaonline.org.
185. TMS - The Masonry Society; www.masonrysociety.org.
186. TPI - Truss Plate Institute; www.tpinst.org.
187. TPI - Turfgrass Producers International; www.turfgrasssod.org.
188. TRI - Tile Roofing Industry Alliance; www.tileroofing.org.
189. UL - Underwriters Laboratories Inc.; www.ul.org.
190. UL LLC - UL LLC; www.ul.com.
191. USAV - USA Volleyball; www.usavolleyball.org.
192. USGBC - U.S. Green Building Council; www.usgbc.org.
193. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
194. WA - Wallcoverings Association; www.wallcoverings.org.
195. WCLIB - West Coast Lumber Inspection Bureau; (see PLIB).
196. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
197. WDMA - Window & Door Manufacturers Association; www.wdma.com.
198. WI - Woodwork Institute; www.woodworkinstitute.com.
199. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
200. WWPA - Western Wood Products Association; www.wwpa.org.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.

3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. CPSC - U.S. Consumer Product Safety Commission; www.cpsc.gov.
2. DOC - U.S. Department of Commerce; www.commerce.gov.
3. DOD - U.S. Department of Defense; www.defense.gov.
4. DOE - U.S. Department of Energy; www.energy.gov.
5. DOJ - U.S. Department of Justice; www.ojp.usdoj.gov
6. DOS - U.S. Department of State; www.state.gov.
7. EPA - United States Environmental Protection Agency; www.epa.gov.
8. FAA - Federal Aviation Administration; www.faa.gov.
9. GPO - U.S. Government Publishing Office; www.gpo.gov.
10. GSA - U.S. General Services Administration; www.gsa.gov.
11. HUD - U.S. Department of Housing and Urban Development; www.hud.gov.
12. LBNL - Lawrence Berkeley National Laboratory; Energy Technologies Area; www.lbl.gov/.
13. NIST - National Institute of Standards and Technology; www.nist.gov.
14. OSHA - Occupational Safety & Health Administration; www.osha.gov.
15. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
16. USACE - U.S. Army Corps of Engineers; www.usace.army.mil.
17. USDA - U.S. Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
18. USDA - U.S. Department of Agriculture; Rural Utilities Service; www.usda.gov.
19. USP - U.S. Pharmacopeial Convention; www.usp.org.
20. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from U.S. Government Publishing Office; www.govinfo.gov.
2. DOD - U.S. Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.dsp.dla.mil/Specs-Standards/.
3. DSCC - Defense Supply Center Columbus; (see FS).
4. FED-STD - Federal Standard; (see FS).
5. FS - Federal Specification; Available from DLA Document Services; www.dsp.dla.mil/Specs-Standards/.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from U.S. General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.

6. MILSPEC - Military Specification and Standards; (see DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (see USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. BEARHFTI; California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; (see BHGS).
2. BHGS; State of California Bureau of Household Goods and Services; (Formerly: California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation); www.bhgs.dca.ca.gov.
3. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.oal.ca.gov/publications/ccr/.
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; https://tfsweb.tamu.edu/.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

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.

1.3 USE CHARGES

A. General: CM@R shall include the cost or use charges for temporary facilities in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner, 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.

1.4 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: CM@R shall arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 INFORMATIONAL SUBMITTALS

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

B. Erosion and Sedimentation Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1.6 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. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.76-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts.

B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete or galvanized steel bases for supporting posts.

C. Paint: Comply with manufacturers recommendations for appropriate paints and application for substrate and exposure.

2.2 TEMPORARY FACILITIES

A. Common-Use Field Office: Clemson will allow JCC to use the existing classroom space on the Lower Level in the adjacent Lever Hall building as a Field Office. The classroom space has a direct exterior exit. Modify existing space to accommodate the needs of Owner, Architect, and CM@R. Use of the space is to include construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Supplement electrical power and data in space as may be needed to adequately support

the functions of the space. Furnish room with conference tables, chairs, and tack and/or marker boards.

3. Drinking water.
4. Coffee machine and supplies.
5. If needed supplement the heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
6. If needed supplement the lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.

B. Restroom facilities will not be available to the CM@R and the architectural/engineering team in Lever Hall. JCC will need to provide a separate restroom facility on the site near the Common-Use Field Office.

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. Locate storage and fabrication sheds as needed in coordination with Owner and in accordance with site logistics plan.

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.

C. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

D. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

E. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".

F. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 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 all in adequate facility quantities to accommodate the number of personnel on the site at any one time. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment 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. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

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

1. Install electric power service overhead or underground, unless directed to provide underground.

I. 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.

J. Mobile phones and Data Service: Provide mobile phone service in common-use facilities to all construction personnel.

1. Provide additional data lines for the following:

a. Provide a dedicated data line for each computer. With adequate service and speed to access the internet, email and the CM@R's construction management software platform efficiently.

2. Post a list of important telephone numbers in a common area.

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 mobile phone for use when away from field office.

K. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities.

3.3 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 (9 m) 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.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations and acquire Architect's and Owner's approval before proceeding.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 321216 "Asphalt Paving."

D. Traffic Controls: CM@R and subcontractors to comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking area provide by Clemson: Clemson will identify and designate an area on campus for construction workers to park. Shuttling of workers to the project site will the CM@R's responsibility.

F. Additional Parking beyond what Clemson is able to Provide: If additional parking is needed above what Clemson can provide that additional parking is the sole responsibility of the CM@R during construction including paying for additional parking and of-site parking and shuttling of workers. JCC employees but not construction workers may park in the designated lay down area within the limits of construction as space is available around the construction lay down and construction activities.

1. If the CM@R or construction workers park outside the construction fence, and not within the are Clemson has designated for parking for this project, they will have to secure parking permits with Clemson University Parking Services and pay the current rate per vehicle per year, renewed in mid August each year.
2. Within the area of the construction fence provide one designated spot for the Architect and one spot for the Owner's representative during scheduled meeting times and pre-arranged site visits.

G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

H. Project Identification and Temporary Signs: CM@R to provide Project identification and other signs to manage construction activities and deliveries in a safe lawful manner. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

1. Provide temporary, directional signs for construction personnel and visitors.
2. Maintain and touchup signs so they are legible at all times.

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

3.4 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. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties.

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree Protection: Refer to Specification Section 022310, “Tree Protection”.

E. 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. Perform control operations lawfully, using environmentally safe materials.

F. Site Enclosure Fence: CM@R has provided a temporary Site Fence Enclosure under a separate Component Change Order, CCO 2. CM@R is to maintain site fence enclosure through the duration of construction and modify the enclosure as the CM@R deems necessary to facilitate construction activities. Temporary site enclosure fence are to be maintained and provided such that they enclose all construction trailers and laydown areas for the duration of the project.

G. Security Enclosure and Lockup: Install substantial temporary enclosure around construction trailer and lay down area. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

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

3.5 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

SECTION 01 57 13 - TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 INTENT

A. The main concern associated with erosion on a construction site is the movement of soil off the site and its impact on water quality. It is the Owner's intent that the Contractor install and maintain sufficient erosion control practices to retain sediment within the boundaries of the site in addition to complying with regulatory authorities having jurisdiction and local erosion and sedimentation control laws and ordinances. All erosion control methods and devices used shall conform to the latest requirements imposed by federal, state and local authorities. The Contractor shall be responsible for repair of any damage caused and shall be financially responsible for any penalties imposed.

B. If an erosion control drawing has been included in the drawings prepared by the engineer, it shall be the Contractor's responsibility to review the drawing prior to implementation. If an erosion control drawing is not included in the project documents, the Contractor shall submit, for approval, a proposed sequence of operations and a compatible method of preventing erosion.

1.02 SUMMARY

A. Work under this section shall include but not be limited to, installation and maintenance of both temporary and permanent soil erosion control measures, slope protection and stabilization measures, protection of all surface water and property both on and off site. This work shall include all labor, materials, and equipment necessary to meet all applicable requirements and as specified in the contract documents.

1.03 REFERENCE STANDARDS

A. All applicable standards and requirements of all regulatory authorities having jurisdiction, including local soil conservation agencies

1.04 QUALITY ASSURANCE

A. Soil erosion and sediment control measures shall be implemented in accordance with the requirements and procedures outlined in this specification, contract drawings and documents, the state standards or guidelines for soil erosion and sediment control, and all regulatory authorities having jurisdiction. Where conflict between requirements exist, the more restrictive rules shall govern.

B. The Contractor shall provide all temporary control measures shown on the drawings, or as directed by the Owner, Owner's representative, or soil conservation district for the duration of the contract. Erosion control drawings are intended to be a guide to address the stages of work shown. Additional erosion control measures not specified on the drawings may be necessary and shall be implemented to address intermediary stages of work and any conditions that may develop during construction at no cost to the Owner.

C. Temporary control provisions shall be coordinated with permanent erosion control features to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post-construction period.

D. Soil erosion and sediment control measures shall at all times be satisfactory to the Owner's Representative. Owner's Representative will inform the Contractor of unsatisfactory construction procedures and operations if observed. If the unsatisfactory construction procedures and operations are not responded to and corrected within 48 hours, the Owner's Representative may suspend the performance of any or all other construction until the unsatisfactory condition has been corrected. Such suspension shall not be the basis of any claim by the Contractor for additional compensation nor

for an extension of time to complete the work. Any complaints, fines, etc. relating to ineffective erosion control, shall be the sole responsibility of the Contractor.

E. The Contractor shall inspect all soil erosion and sediment control measures at least at the beginning and end of each day to ascertain that all devices are functioning properly during construction. Maintenance of all soil erosion and sediment control measures on the project site shall be the responsibility of the Contractor until the project is 100% complete, and until the permanent soil erosion controls are established and in proper working condition.

F. The Contractor shall protect adjacent properties and watercourses from soil erosion and sediment damage throughout construction.

1.05 SEQUENCE OF CONSTRUCTION

A. The approved construction sequence, as permitted/approved shall be adhered to during the execution of work under this section. All soil erosion and sediment control measures shall be installed in accordance with the phasing sequence shown on the contract documents.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Contractor shall provide all materials necessary to perform the work.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. The Contractor shall comply with and implement the Stormwater Pollution Prevention Plan, if the plan is provided in the contract documents.

B. Review the soil erosion and sediment control drawings as they apply to current site conditions. Any deviation from the drawings must be submitted for approval to the site engineer in writing at least 72 hours prior to commencing that work.

C. Notify county or municipal soil conservation district, in writing at least 72 hours prior to initial land disturbance.

D. All soil sediment and erosion control devices shall be in place prior to any earthwork construction, in their proper sequence, and maintained until permanent protection is established.

E. The limit of the area of any earthwork operations in progress shall be commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding and other such permanent control measures current and in accordance with the accepted schedule for construction phasing. Should seasonal limitations make such coordination unrealistic, as determined by the Owner's Representative, temporary erosion control measures shall be provided immediately by the Contractor at no expense to the Owner.

F. Temporary erosion control measures shall be used to correct conditions which develop during construction that are needed prior to installation of permanent control features, or that are temporarily needed to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

G. The Contractor shall incorporate all permanent erosion control features into the project at the earliest practical time to minimize the need for temporary controls.

H. A temporary construction entrance pad shall be installed and maintained at any point where construction vehicles enter a public right-or-way, street or parking area. The pad shall be used to eliminate mud from the construction area onto public right-of-way. The pad shall be constructed as shown on the drawings. Any mud or debris tracked on streets shall be cleaned up immediately.

I. Any disturbed or stockpiled areas that will be left exposed more than 14 days or less according to State NPDES General Stormwater Permits, and not subject to construction traffic, shall immediately

receive a temporary seeding. Mulch/straw shall be used if the season prevents the establishment of a temporary cover. Disturbed areas shall be limed and fertilized prior to temporary seeding.

J. Permanent vegetation shall be established as specified on all exposed areas within 14 days or less according to State NPDES General Stormwater Permits after final grading. Mulch as necessary for seed protection and establishment. Lime and fertilize seedbed prior to permanent seeding.

K. Cut slopes shall be permanently seeded and mulched as the excavation proceeds to the extent considered desirable and practical. Slopes that erode easily shall be temporarily seeded and mulched.

L. All storm drainage outlets must be stabilized, as specified, before the discharge points become operational. Equip all inlets with inlet protection immediately upon construction.

M. Discharge from de-watering operations for the excavated areas shall not be directed to surface waters without first properly removing the suspended sediment through filtration and/or settlement. The Contractor shall obtain any required permits associated with dewatering activities.

N. The quantity of silt fence to be installed will be affected by the actual conditions that occur during the construction of the project. Silt fence shall be installed at locations shown on the drawings and any additional locations necessary for proper erosion control. The Contractor shall maintain the silt fence until the project is accepted and shall remove and dispose of the silt fence and silt accumulations.

O. Soil erosion and sediment control shall include but not be limited to the approved measures. The Contractor shall be responsible for providing all additional measures that may be necessary to accomplish the intent of the drawings.

P. Comply with all other requirements of authorities having jurisdiction.

3.02 Stabilization Requirements

A. Temporary Seeding – The purpose of temporary seeding is to reduce erosion control and sedimentation by stabilizing disturbed areas that would otherwise lay bare for long periods of time before they are worked or stabilized. Temporary seeding is also used where permanent vegetation growth is not necessary or appropriate.

1. When and Where to use it – Temporary seeding is to be used on exposed soil surfaces such as denuded areas, soil stockpiles, dikes, dams, banks of sediment basins, banks of sediment traps, and temporary road banks. Temporary stabilization is REQUIRED within 14 days after construction activity is complete UNLESS construction activity is going to resume within 21 days. When the temporary vegetation does not grow quickly or thick enough to prevent erosion control, re-seed as soon as possible.

2. Seed selection – Seed selection is based on geographical location, soil type and season of the year in which planting is to be done. Use the tables below from Appendix C of the SCDHEC Stormwater BMP Handbook for guide to conventional tillage methods (plowing, seedbed preparation, hydroseeding, etc.) If a fast growing crop is needed to nurse the permanent specie, then use the mix rate. Failure to carefully follow agronomic recommendations results in an inadequate stand of temporary vegetation that provides little or no erosion control.

Temporary Seeding - Upstate

Species	lbs./ac	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Browntop Millet (Alone)	40												
Browntop Millet (Mix)	10												
Rye Grain (Alone)	56												
Rye Grain (Mix)	10												
Rye Grass (Alone)	50												
Rye Grass (Mix)	8												
For Steep Slopes/Cut Slopes													
Weeping Lovegrass (Alone)	4												
Weeping Lovegrass (Mix)	2												

Temporary Seeding – Coastal

Species	Lbs/Ac	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sandy, Droughty Sites													
Browntop Millet	40 lbs./ac.												
Rye, Grain	56 lbs./ac.												
Ryegrass	50 lbs./ac.												
Well drained, clayey/loamey Sites													
Browntop Millet or Japanese Millet	40 lbs./ac.												
Rye, Grain or Oats	56 lbs./ac. 75 lbs./ac.												
Ryegrass	50 lbs./ac.												

3. Installation –
   a. Tillage – If the area has been recently plowed, no tillage is required other than raking or surface roughening to break the crust that has formed leaving a textured surface. Disk the soil for optimal generation when the soil is compacted less than 6-inches.
   b. Soil Testing – Soil testing should be completed on every site to optimize the amount of fertilizer and lime added to the site. Soil testing is available through Clemson University Cooperative Extension Service.
   c. Lime – Lime is not required for temporary seeding unless a soil test shows that the soil pH is below 5.0. It may be desirable to apply lime during the temporary seeding operation to benefit the long-term permanent seeding. Apply as the soil test directs,

but at a minimum of 1.5 tons of Lime/acre (70 pounds per 1000 square feet) if it is to be used.

d. Fertilizer – Apply a minimum of 500 pounds per acre of 10-10-10 fertilizer (11.5 pounds per 1000 square feet) or equivalent during temporary seeding unless the soil test indicates a different requirement. Incorporate fertilizer and lime into the top 4-6 inches of soil by disking or other means where conditions allow.

e. Seeding – Loosen the soil surface before broadcasting the seed. Apply seed evenly by the most convenient method available for the type of seed used and the location of the temporary seeding. Typical application methods include but are not limited to cyclone seeders, rotary spreaders, broadcast spreaders, hand spreaders, cultipack seeder, and hydro-seeders. Cover applied seed by raking or dragging a chain and then lightly firm the area with a roller or cultipacker.

f. Mulching – Use mulch with temporary seed applications to retain moisture and reduce erosion during establishment of vegetation. Typical mulch applications include straw, wood fiber, hydromulches, BFM and FGM. Use hydromulches with a minimum blend of 70% wood fibers. Small grain straw is normally the best for temporary seeding applications. The straw should be dry and free from mold damage and noxious weeds. The straw may need to be anchored with netting or emulsions to prevent it from being blown or washed away. Apply the straw mulch by hand or machine at a rate 1.5-2 tons per acre (90 pounds per 100 square feet). Frequent inspections are necessary to check that conditions for growth are good.

g. Irrigation – Seeded areas should be kept adequately moist. Irrigate the seeded area if normal rainfall is not adequate for the germination and growth of the seedlings. Water seeded areas at controlled rates that are less than the rate at which the soil can absorb water to prevent runoff. Runoff of irrigation water wastes water and can cause erosion.

h. Reseeding – Re-seed areas that do no grow quickly, thick enough, or adequately to prevent erosion.

4. Inspection and Maintenance

a. Inspect at a minimum of once every calendar week, with no time period between inspections exceeding 9 days, and must be conducted until final stabilization is reached on all areas of the construction site.

b. Cover seeded area with mulch to provide protection. Frequent inspections are necessary to check that conditions are good for growth.

c. Supply temporary seeding with adequate moisture. Supply water as needed, especially in abnormally hot or dry weather or on adverse sites. Control water application rates to prevent runoff.

d. Re-seed areas where the plants do not grow quick enough, thick enough, or adequately enough to prevent erosion.

5. Preventative Measures and Troubleshooting Guide

a. Slope was improperly dressed before application – Roughen slopes. Furrow along the contour of areas to be seeded.

b. Coverage is inadequate – Follow recommended application rates. County the number of seedbags to ensure the correct amount of material is being applied. Reapply to thin areas.

c. Seed fails to germinate – Apply straw mulch to keep seeds in place and to moderate soil moisture and temperature. In arid areas, temporary irrigation may be necessary.

d. Seeded slope fails – Fill in rills and re-seed; fertilize, and mulch slopes.

e. Seeding is washed off slope – Allow at least 24-hours for the materials to dry before a rain event. Follow manufacturer's recommendations. Reapply where necessary.
f. Excessive water flows across stabilized surface – Use other BMPs to limit flow on stabilized areas and to reduce slope lengths. Do not use stabilized areas with swift moving concentrated flows.

B. Permanent Seeding – The purpose is to control runoff and prevent erosion by establishing a perennial vegetative cover with seed.
1. When and Where to use it – A major consideration in the selection of the type of permanent grass is to establish the intended use of the land. Land use is separated in to two categories, high-maintenance and low-maintenance.
a. High Maintenance – These areas are to be mowed frequently, limed or fertilized on a regular basis, and require maintenance to an aesthetic standard.
b. Low Maintenance – These areas are to be mowed infrequently, if at all, and lime and fertilizer may not be applied on a regular schedule. The vegetation must be able to survive with little maintenance over long periods of time. Grass and legume mixtures are favored in these areas because legumes are capable of fixing nitrogen in the soil for their own use and the use of grasses around them.
2. Seed Selection – The use of native species is preferred when selecting vegetation. Seed selection is based on geographical location, soil type and season of the year in which planting is to be done. Use the tables below from Appendix C of the SCDHEC Stormwater BMP Handbook for guide to conventional tillage methods (plowing, seedbed preparation, hydroseeding, etc.)

Permanent Seeding - Upstate

Species	Lbs/Ac	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bahia Grass (Alone)	40												
Bahia Grass (Mix)	30												
Bermuda Grass (hulled) (Alone)	8-12												
Bermuda Grass (hulled) (Mix)	4-6												
Fescue, Tall (KY31) Alone	40												
Fescue, Tall (KY31) mix	20												
Sericea Lespedeza (Scarified) Alone or Mix (inoculate with EL Innoculant	40												
Ladino Clover (mix only) Innoculate with AB Innoculant	2												
For Steep Slopes/Cut Slopes													
Weeping Lovegrass (Alone)	4												
Weeping Lovegrass (Mix)	2												
Crownvetch (Mix) (Inoculate with Type M Innoculant	8-10												

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Permanent Seeding - Coastal

Species	Lbs/Ac	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sandy, Droughty Sites													
Browntop Millet Bahiagrass	10 lbs./ac. 40 lbs./ac.												
Browntop Millet Bahiagrass Sericea Lespedeza	10 lbs./ac. 30 lbs./ac. 40 lbs/ac.												
Browntop Millet Atlantic Coastal Panicgrass	10 lbs./ac. 15 lbs./ac. PLS												
Browntop Millet Switchgrass (Alamo) Little Bluestem Sericea Lespedeza	10 lbs./ac. 8 lbs./ac. PLS 4 lbs./ac. 20 lbs./ac.												
Browntop Millet Weeping Lovegrass	10 lbs./ac. 8 lbs./ac.												
Well drained, clayey/loamey Sites													
Browntop Millet Bahiagrass	10 lbs./ac. 40 lbs./ac.												
Rye, Grain Bahiagrass Clover, Crimson (Annual)	10 lbs./ac. 40 lbs./ac. 5 lbs./ac.												
Browntop Millet Bahiagrass Sericea lespedeza	10 lbs./ac. 30 lbs./ac. 40 lbs./ac.												
Browntop Millet Bermuda, Common Sericea lespedeza	10 lbs./ac. 10 lbs./ac. 40 lbs./ac.												
Browntop Millet Bermuda, Common Kobe Lespedeza (Annual)	10 lbs./ac. 12 lbs./ac. 10 lbs./ac.												
Browntop Millet Bahiagrass Bermuda, Common Sericea lespedeza	10 lbs./ac. 20 lbs./ac. 6 lbs./ac. 40 lbs./ac.												
Browntop Millet Switchgrass Little Bluestem Indiangrass	10 lbs./ac. 8 lbs./ac. PLS 3 lbs./ac. PLS 3 lbs./ac. PLS												

3. Installation
   a. Topsoil – Apply topsoil if the surface soil of the seedbed is not adequate for plant growth.
   b. Tillage – If the area has been recently plowed, no tillage is required other than raking or surface roughening to break the crust that has formed leaving a textured surface. Disk the soil for optimal generation when the soil is compacted less than 6-inches. If the soil is compacted more than 6-inches, sub-soiled and disk the area.

c. Soil Testing – Soil testing should be completed on every site to optimize the amount of fertilizer and lime added to the site. Soil testing is available through Clemson University Cooperative Extension Service.
d. Lime –Apply as the soil test directs, but at a minimum of 1.5 tons of Lime/acre (70 pounds per 1000 square feet) if it is to be used.
e. Fertilizer – Apply a minimum of 1000 pounds per acre of 10-10-10 fertilizer (23 pounds per 1000 square feet) or equivalent during permanent seeding of grasses unless the soil test indicates a different requirement. Incorporate fertilizer and lime into the top 4-6 inches of soil by disking or other means where conditions allow. Do not mix the lime and fertilizer prior to field application.
f. Seeding – Loosen the soil surface before broadcasting the seed. Apply seed evenly by the most convenient method available for the type of seed used and the location of the temporary seeding. Typical application methods include but are not limited to cyclone seeders, rotary spreaders, broadcast spreaders, hand spreaders, cultipack seeder, and hydro-seeders. Cover applied seed by raking or dragging a chain and then lightly firm the area with a roller or cultipacker.
g. Mulching – Cover all permanent seeded areas with mulch immediately upon completion of the seeding application to retain soil moisture and reduce erosion during establishment of vegetation. Apply the mulch evenly to such a manner that it provides a minimum 75% coverage. Typical mulch applications include straw, wood fiber, hydromulches, BFM and FGM. Use hydromulches with a minimum blend of 70% wood fibers. The most preferred mulch to be used in conjunction with permanent seeding is small grain straw. Select straw that is free from mold damage and noxious weeds. The straw may need to be anchored with netting or asphalt emulsions to prevent it from being blown or washed away. Apply straw mulch by hand or machine at the rate of 2 tons per acre (90 pounds per 1000 square feet). Frequent inspections are necessary to check that the conditions for growth are good.
h. Irrigation – Seeded areas should be kept adequately moist. Irrigate the seeded area if normal rainfall is not adequate for the germination and growth of the seedlings. Water seeded areas at controlled rates that are less than the rate at which the soil can absorb water to prevent runoff. Runoff of irrigation water wastes water and can cause erosion.
i. Reseeding – Inspect permanently seeded areas for failure, make necessary repairs and re-seed or overseed within the same growing season if possible. If the grass cover is sparse or patchy, re-evaluate the choice of grass and quantities of lime and fertilizer applied. Final stabilization by permanent seeding of the site requires that it be covered by a **70% coverage rate.**

4. Inspection and Maintenance –
a. Inspect seeded areas for failure and make necessary repairs and re-seed immediately.
b. If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.
c. If a stand of permanent vegetation has less than 40 percent cover, re-evaluate choice of plant materials and quantities of lime and fertilizer.
d. Re-establish the stand following seed bed preparation and seeding recommendations.
e. If the season prevents re-sowing, mulch is an effective temporary cover. However, the contractor is responsible for providing 70% cover of permanent cover for close out of the project.
f. Final stabilization requires 70 percent overall coverage rate. This does not mean that 30 percent of the site can remain bare. The coverage is defined as looking at a square yard of coverage, in which 70 percent of that square yard is covered with vegetation.

5. Preventative Measures and Troubleshooting Guide –
    a. Areas have eroded – Re-seed or replace eroded areas.
    b. Vegetation cover is inadequate and rill erosion is occurring – Overseed and fertilize in accordance with soil test results
    c. Stand of permanent vegetation has less than 40% cover – re-evaluate choice of plant materials and quantities of lime and fertilizer.
    d. Vegetation shows signs of wilting before noon – Water vegetation by wetting soil to a depth of 4-inches.

C. Sodding – Sodding is transplanting vegetative sections of plant materials to promptly stabilize areas that are subject to erosion. Use commercial sod which is a cultured product instead utilizing specific grass species.
1. When and Where to use it – Sodding is appropriate for any graded or cleared area that may erode, or where a permanent, long-lived plant cover is immediately needed. Examples of where sodding is used are yards, buffer zones, stream banks, dikes, swales, slopes, outlets, level spreaders, and filter strips.
2. Installation –
    a. In general, do not use sod on slopes greater than 2:1 or 3:1 if it is mowed. If sod is placed on steep slopes, lay it with staggered joints and/or stable the sod down.
    b. Clear the soil surface of trash, debris, roots, branches and soil clods in excess of 2-inches length or diameter. Rake soil surface to break curst just before laying sod or irrigate soil lightly if the soil is dry. D not install sod on hot, dry or frozen soil, gravel, compacted clay or pesticide treated soils.
    c. Harvest, deliver and install sod within a period of 36-hours. Store rolls of sod in shade during installation. Sod should be free of weeds and be of uniform thickness, about 1-inch, and should have a dense root mat for mechanical strength.
    d. Lay strips of sod beginning at the lowest area to be sodded with the longest dimension of the strip perpendicular to the slope and stagger in a bricklike patter. Wedge strips securely in place. Square ends of strip to provide for a close, tight fit. Match angled ends correctly to prevent voids.
    e. Roll or compact immediately after installation to ensure firm contact with underlaying topsoil.
    f. Irrigate the sod until the soil is wet to a depth of 2-inches, and keep most until grass takes root.
3. Inspection and Maintenance
    a. Watering may be necessary after planning and during periods of intense heat and/or lack of rain. Keep soil moist to a depth of 2-inches until sod is fully rooted.
    b. Mow to a height of 2 to 3 inches after sod is well-rooted (2-3 weeks). Do not remove more than 1/3 of the shoot in any one mowing.
    c. Permanent, fine turf areas require yearly applications of fertilizer and lime.
    d. Inspect the sod frequently after it is first installed, especially after large storm events, until it has established a permanent cover.

D. Mulching – Temporary soil stabilization erosion control method where materials such as hay, grass, wood chips, wood fibers, or straw are placed on the soil surface.
1. When and Where to use it – Use erosion control mulching on level areas or on slopes up to 50%. Where soil is highly erodible, nets should only be used in connection with organic mulch such as straw or wood fiber. Mulch is an effective ground cover when the establishment vegetation is improbably due to severe weather conditions (winter conditions), poor soil, or steep slopes.

2. Installation –
    a. Grading is not necessary before mulching but may be required if vegetation is expected to grow.
    b. Anchor loose hay or straw by applying tackifier, stapling netting over the top, or crimping with a mulch crimping tool.
    c. Effective use of netting and matting requires firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.
    d. Materials that are heavy enough to stay in place do not need anchoring. (bark or wood chips on flat slopes)
    e. There must be adequate coverage to prevent erosion, washout, and poor plant establishment. If an appropriate tacking agent is not applied, or is applied in insufficient amounts, mulch is lost to wind and runoff.
3. Inspection and Maintenance
    a. Inspect at a minimum of once every calendar week, with no time period between inspections exceeding 9 days, and must be conducted until final stabilization is reached on all areas of the construction site.
    b. Repair or replace damaged areas of mulch or tie down immediately.
4. Preventative Measures and Troubleshooting Guide –
    a. Mulch blows away – Anchor straw mulch in place by applying a tackifier, crimping, punching, or track walking. May need to use a different BMP.
    b. Coverage is inadequate – Follow recommended application rates. Ensure the correct amount of material is implemented. Reapply if necessary.
    c. Mulch has washed away – Do not place mulch in concentrated flow areas. Reapply as necessary.
    d. Area was improperly dressed before application – Remove existing vegetation and roughen embankment and fill areas by rolling with a punch type roller or by track walking.
    e. Excessive water flows across stabilized surface – Use other BMPs to limit flow onto stabilized area and/or to reduce slope lengths. Do not use stabilized areas with swift moving concentrated flows.

E. Erosion Control Blanket (ECB) - Temporary erosion control blankets (ECBs) are products composed primarily of biologically, photochemically or otherwise degradable constituents such as wheat straw, coconut fiber, or aged curled excelsior wood product with longevity of approximately 1- to 3-years.
1. When and Where to Use it - ECBs are used for temporary stabilization of soil immediately following seeding until the vegetative cover has grown and becomes established. ECBs provide temporary protection by degrading over time as the vegetation becomes established. Some products are effective for a few months while other degrade slowly and are effective up to 3-years.
2. ECB Categories
    a. Class A (Slope Applications Only) – Applicable for slopes 2:1 or flatter only. Slopes greater than 2:1 require Turf Reinforcement Matting (TRM).
    b. Class B (Channel Applications Only) – Applicable for channels and concentrated flow areas with maximum calculated shear stress less than 1.75 lb/ft^2. Channels and concentrated flow areas with design shear stresses greater than 1.75 lb/ft^2 require TRM.
    c. All ECBs consisting of straw, coconut, or straw- coconut blends must meet the flowing requirements:

1) Utilize non-organic, photodegradable or biodegradable polypropylene netting.
2) Consist of double netted matting, defined as matting with netting on both sides of the blanket. The top netting is biodegradable polypropylene with a maximum mesh opening of 0.75 inches by 0.75 inches. The bottom is degradable polypropylene with a maximum mesh opening of 0.5 inches by 0.5 inches.
3) Be sewn on center a maximum of 2.0 inches.

d. All ECBs consisting of curled excelsior fibers must meet the following requirements:
1) Utilize non-organic, photodegradable or biodegradable polypropylene netting.
2) Consist of double netted matting. Double netted matting is matting with netting on both sides of the blanket. The degradable polypropylene top netting requires a maximum mesh opening of 1.0-inches by 1.0-inches., while the degradable polypropylene bottom netting requires a maximum mesh opening of 1.0-inches by 1.0-inches.
3) Consist of curled excelsior interlocking fibers with 80% of the fibers a minimum of 6-inches long.
4) Sewn on center a maximum of 4.0-inches.

e. Use Class A and Class B temporary erosion control blankets having the following Minimum Average Roll Value (MARV) for physical properties, as derived from quality control testing performed by a Geosynthetic Accreditation Institute – Laboratory Accreditation Program (GAI_LAP) accredited laboratory:
1) Minimum mass per unit area (ASTM D6475) of 6 oz/yd^2 (203 g/m^2)
2) Minimum thickness (ASTM D6525) of 0.25-inches (6mm)
3) Minimum initial grab tensile strength (ASTM D6818) of 75 x 75 lb/ft. (1 x 1 kN/m)
4) Minimum roll width of 48-inches (1.22 m)
5) For Class B channel applications, a minimum unvegetated shear stress of 1.0 lb/ft^2 (48 N/m^2) based on short-term peak flow duration of 0.5 hour is required.

3. Inspection and Maintenance -
a. Inspect areas protected by ECBs for dislocation or failure a minimum of once every calendar week, with no time period between inspections exceeding 9 days, and must be conducted until final stabilization is reached on all areas of the construction site.
b. Conduct regular inspections until grasses are firmly established.
c. Adhere to pinning or stapling pattern as shown on the Manufacturer's installation sheet. If there is evidence that the ECB is not securely fastened to the soil, require extra pins and staples to inhibit the ECB from becoming dislodged.
d. If washout or breakage occurs, repair all damaged areas immediately by restoring the soil on slopes or channels to its finished grade, re-apply fertilizer and seed, and replacing the appropriate ECB material as needed.

4. Preventative Measures and Troubleshooting Guide
a. Undercutting occurs along the top of the slope – Dig a 6 x 6-inch trench along the top of the slope and anchor blanket into trench by back filling and tamping the soil.
b. Blankets separate along the seams – Overlap adjacent blanket 2- to 3-inches and staple every 3-feet.
c. Blankets separate where the rolls area attached end to end – Shingle the blanket so the top blanket covers the bottom blanket by 6-inches and staple through the overlapped areas every 12-inches.
d. Blanket does not make completed contact with the soil surface – Prepare the soil surface by removing rocks, clods, sticks and vegetation, fill in rill, uneven areas.

e. Excessive water flows across the stabilized surface – Use other BMPs to limit flow on stabilized area. Use other BMPs to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows.

F. Turf Reinforcement Matting – products composed primarily of nondegradable products that enhance the ability of living plants to stabilize soils. They bind with roots to reinforce the soil matrix with longevity greater than 5-years.

1. When and where to use it – Use TRMs where vegetation alone will not hold a slope or streambank. TRMs enable the use of "green" solutions in areas where only "hard" solutions such as riprap or concrete linings were viable in past. The major structural components of Type 1 and Type 2 TRMs are 100% synthetic and resistant to biological, chemical, and ultraviolet degradation. A degradable fiber matrix may be included to provide immediate cover for bare soil. All components of Type 3 and Type 4 TRMs are 100% synthetic and resistant to biological, chemical, and ultraviolent degradation.
   a. Type 1 – Placed on slopes 2:1 or flatter or in channels where the calculated design shear stress is 4.0 lb/ft^2 or less and the design flow is up to 10 fps.
   b. Type 2 – Placed on slopes 1.5:1 or flatter or in channels where the calculated design shear stress is 6 lb/ft^2 or less and the design flow velocity is up to 15 fps.
   c. Type 3 – Placed on slopes 1:1 or flatter or in channels where the calculated design shear stress is 8.0 lb/ft^2 or less and the design flow velocity is up to 20 fps.
   d. Type 4 – (High survivability) Specially designed for erosion control applications on steep slopes and vegetated waterways. Placed on slopes 1:1 or greater or in channels where the calculated shear stress is up to 12 lb/ft^2 and the design flow velocity is up to 25 fps.
2. Installation –
   a. Grade and compact areas to be protected with TRMs as indicated on the plans.
   b. Remove large rocks, soil clods, vegetation, and other sharp objects.
   c. Prepare seedbed by loosening 2 to 3 inches of soil above final grade.
   d. The recommended installation procedure from the specific manufacturer should be followed.
   e. When requested, a letter from the manufacturer approving the contractor installation may be required.
3. Inspection and Maintenance –
   a. Check areas protected by TRMs for dislocation or failure every calendar week, with no time period between inspections exceeding 9 days, and must be conducted until final stabilization is reached on all areas of the construction site.
   b.
   c. Conduct regular inspections until grasses are firmly established.
   d. Adhere to the pinning and stapling patter as shown on the manufacturer's installation sheet.
   e. If washout or breakage occurs, repair all damaged areas immediately by restoring the soil on slopes or channels to its finished grade, re-apply fertilizer and seed, replacing the appropriate TRM material as needed.
4. Preventative Measures and Troubleshooting Guide –
   a. Improper anchoring – Dig trench along the top and bury the blankets. Use staples to anchor according to manufacturer's recommendations.
   b. Undercutting due to inadequate preparation – Prepare the soil surface. Remove rocks, clods, and other obstructions. Fill in rills in uneven areas to promote good contact between mat and soil.

c. Excessive water flows across the stabilized slope surface – Use other BMPs to limit flow on stabilized area. Use other BMPs to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows.

G. Flexible Growth Media/Matrix – (FGM) combines both chemical and mechanical bonding techniques to lock the matrix in place. FGM has air spaces and water-absorbing cavities that improve seed germination, reduce the impact of raindrop energy, and minimize soil loss. Water insoluble tackifiers and flocculants chemically bond the matrix to the soil surface.

1. When and where to use it – FGM is applicable for the following situations:
   a. Type A temporary erosion control blanket.
   b. Slopes up to 2:1
   c. As an infill for TRMs on slopes greater than 2:1
   d. Environmentally sensitive areas not compatible for netting
   e. When the required longevity of soil protection is up to 1 year
   f. When the site requires immediate erosion protection and there is a risk of impending weather
   g. When fast vegetation establishment is required
   h. When a high factor of design safety is requires
2. Installation –
   a. Under no circumstances is field mixing of materials, additives, or components accepted.
   b. Examine substrates and conditions where materials will be applied.
   c. Apply FGM only to geotechnically stable slopes that have been designed and constructed to divert runoff away from the face of the slope. Do not proceed with installation until satisfactory conditions are established.
   d. Strictly comply with the Manufacturer's mixing recommendations and installation instructions.
   e. Use approved hydraulic seeding/mulching machines with fan-type nozzle (50 degree tip) for FGM applications.
   f. Apply FGM from opposing directions to soil surface in successive layers, reducing the "shadow effect" to achieve maximum coverage of all exposed soil.
   g. FGM does not require cure time and is effective immediately such that FGM may be applied immediately before, during or after rainfall event.
3. Inspection and Maintenance –
   a. Check areas protected by FGM for dislocation or failure every calendar week, with no time period between inspections exceeding 9 days, and must be conducted until final stabilization is reached on all areas of the construction site.
   b. Reapply FGM to disturbed areas that require continued erosion control.
   c. Maintain equipment to provide uniform application rates. Rinse all mixing and application equipment thoroughly and with water to avoid formation of residues and discharge rise water appropriately.
   d. Degradation of FGM is expected to occur as a result of mechanical degradation, chemical and biological hydrolysis, sunlight, salt and temperature. Reapply FGM in accordance with the Manufacturer's instructions. Reapplication is not required unless FGM treated soils are disturbed or turbidity or water quality shows the need for an additional application.
4. Preventative Measures and Troubleshooting Guide

a. Slope areas have eroded due to concentrated flows - Make sure the upper end of the slope has a berm constructed to eliminate concentrated flows from flowing down the slope. Slope length may be too long and concentrated flows are occurring. Use sediment tubes or other practices to provide slope breaks. Re-apply FGM to eroded areas once the concentration has been resolved.
b. Rain event is impending – FGM does not require a cure time and is effective immediately such that FGM may be applied immediately before, during or after a rainfall event.
c. FGM has degraded – FGM has a longevity of soil protection up to 1 year. In some instances degradation of FGM occurs as a result of mechanical degradation, chemical and biological hydrolysis, sunlight, salt and temperature. Reapply FGM in accordance with the manufacturer's instructions. Reapplication is not required unless FGM treated soils are disturbed or turbidity or water quality shows the need for additional application.

H. Bonded Fiber Matrix (BFM) – Eliminates direct raindrop impact on soil, allows no gaps between the product and the soil, and has a high water-holding capacity. BFMs do not form a water-intensive crust that can inhibit plant growth. BFMs are completely photo- and biodegradable.
1. When and where to use it – BFMs are applicable when:
a. Enhancement of temporary seeding operations to reduce erosion and expedite seed germination.
b. A high performance mulch is required for permanent seeding.
c. Seeding applications will take place on highly erodible soil or slopes.
d. Slopes up to 1:1.
e. The required functional longevity of soil protection is 6 months or less.
f. The soil is dry and rain is not expected within 48 hours of application.
g. There is a high degree of certainty that heavy rains will not follow application.
h. NOT applicable as Type A temporary erosion control blankets, channel liners, or for areas receiving concentrated flow.
2. Installation –
a. All BFM components are pre-packaged by the manufacturer and under no circumstances shall field mixing of materials, additives, or components be acceptable.

b. Apply BFM to geotechnically stable slopes that have been designed and built to divert runoff water away from the face of the slope, eliminating the damage to slope face caused by the surface flow from the slope.
c. Install BFM with a contractor who is certified and trained by the manufacturer in proper procedures for mixing and applying the BFM.
d. Strictly comply with manufacturer's recommendations and installation instructions. Use approved hydraulic seeding/mulching machines with fan-type nozzle (50 degree tip) for BFM applications. Apply BFM from opposing directions to the soil surface in successive layers, reducing the "shadow effect" to achieve maximum coverage of all exposed soil.
e. Do not apply the BFM immediately before, during or after rainfall.
f. Do not exceed the maximum slope length of 100 feet when slope gradients are steeper than 4:1.
g. Install BFMs at a general application rate of 3500 pounds per acre unless the manufacturer recommends otherwise.
3. Inspection and Maintenance –

a. Check areas protected by BFM for dislocation or failure every calendar week, with no time period between inspections exceeding 9 days, and must be conducted until final stabilization is reached on all areas of the construction site.
b.
c. Reapply BFM to disturbed areas that required continued erosion control.
d. Maintain equipment to provide uniform application rates.
e. Rinse all BFM mixing and application equipment thoroughly with water to avoid formation of residues and discharge rise water appropriately.
f. Degradation of BFM is expected to occur as a result of mechanical degradation, chemical and biological hydrolysis, sunlight, salt and temperature. Reapply according to manufacturer's recommendations.

4. Preventative Measures and Troubleshooting Guide
   a. Slope areas have eroded due to concentrated flows - Make sure the upper end of the slope has a berm constructed to eliminate concentrated flows from flowing down the slope. Slope length may be too long and concentrated flows are occurring. Use sediment tubes or other practices to provide slope breaks. Re-apply BFM to eroded areas once the concentration problem has been resolved.
   b. Rain event is impending – BFM requires a cure time. Do not apply the BFM immediately before, during or after rainfall. Allow the BFM a minimum of 24 hours to try after installation.
   c. BFM has degraded – BFM has a longevity of soil protection up to 6-months. In some instances degradation of BFM occurs as a result of mechanical degradation, chemical and biological hydrolysis, sunlight, salt and temperature. Reapply BFM in accordance with the manufacturer's instructions. Reapplication is not required unless BFM treated soils are disturbed or turbidity or water quality shows the need for additional application.

END OF SECTION 01 57 13

SECTION 01 60 00 - PRODUCT REQUIREMENTS

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 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 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 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.

1.4 SUBMITTALS

A. Substitution Requests: Submit request for consideration prior to the preconstruction meeting on CM@R's web based construction management software. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. 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.
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.

2. 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 10 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Written Approval by Architect.

B. Comparable Product Requests: Submit requests for consideration on CM@R's web based construction management software. . 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 10 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: Action on Architect's Submittal Stamp

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

1.5 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.

1.6 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. Coordinate scheduling of delivery of materials with CM@R and comply with CM@R's requirements.
2. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
3. 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.
4. 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.
5. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Coordinate storage of materials with CM@R and comply with CM@R's requirements.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements, under cover above ground, with ventilation adequate to prevent condensation.

5. Store cementitious products and materials on elevated platforms.
6. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
7. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
8. Protect stored products from damage and liquids from freezing.
9. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 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 49 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. Where products are accompanied by the term "as selected," Architect will make selection.
4. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
5. 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. Timing: Architect will consider requests for substitution if received within 90 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect/Owner.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner an 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

SECTION 01 73 00 - EXECUTION

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. Field engineering and surveying.
3. General installation of products.
4. Coordination with Work under Other Contracts
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. 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. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Certified Surveys: Submit two (2) paper copies signed by land surveyor and (1) one electronic copy to the CM@R to be uploaded to the CM@R’s web based construction management software.

E. Final Property Survey: Submit five (5) copies showing the Work performed and record survey data unless digital copies have been deemed acceptable by Owner and Architect, and (1) one electronic copy to the CM@R to be uploaded to the CM@R's web based construction management software.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

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

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, 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.
3. If existing utilities are uncovered, Contractor can recover cost to relocate as required. Contractor can also recover cost to adjust new utilities to meet of conform with the existing utilities as required.

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 or professional engineer 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. Construction Lines and Levels: Locate and lay out control lines and levels for structures, 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.

D. 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. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Final Property Survey: Prepare a final property survey of areas within limits of work showing significant features (real property) for Project. Include on the survey a certification, signed by certified 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 7 feet 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 structural 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 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. At Substantial Completion, 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.

3.7 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.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."

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.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

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

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

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

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

END OF SECTION 01 73 00

SECTION 01 73 29 - CUTTING AND PATCHING

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 49 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. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

1. Primary operational systems and equipment.
2. Fire-suppression systems.
3. Mechanical systems.
4. Electrical systems.

C. 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

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.6 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 prevent or minimize 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 bance 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: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

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.

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

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements apply to this Section.

1.2 SUMMARY

A. 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 Requirements:

1. Section 01 81 13.54 Sustainable Design Requirements – Green Globes 2021

1.3 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.

1.4 GENERAL

A. The CM@R is responsible for managing and disposing of construction waste for the entire project. This specification section is intended to be all inclusive of the demolition and construction waste that will be encountered throughout the FULL duration of the Bryan Mall High Rises Renovation project.

1.5 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 90 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials including the following:

1. Demolition Waste:

a. Asphalt paving.
b. Concrete.
c. Concrete reinforcing steel.
d. Concrete masonry units (CMU)
e. Brick
f. Wood framing
g. Plywood and oriented strand board.
h. Wood trim and paneling.
i. Structural and miscellaneous steel.
j. Rough hardware.
k. Roofing
l. Insulation
m. Doors and frames.
n. Door hardware.
o. Windows.
p. Glazing.
q. Metal studs.
r. Gypsum board.
s. Acoustical tile panels
t. Acoustical ceiling grid
u. Carpe and carpet pad.
v. Demountable partitions
w. Equipment.
x. Cabinets.
y. Plumbing fixtures.
z. Piping.
aa. Supports and hangers.
bb. Valves.
cc. Sprinklers.
dd. Mechanical ductwork
ee. Mechanical equipment.
ff. Refrigerants.
gg. Electrical conduit.
hh. Copper wiring.
ii. Lighting fixtures.
jj. Lamps.
kk. Ballasts.
ll. Electrical devices.
mm. Panelboards.
nn. Transformers

2. Construction Waste:

   a. Masonry and CMU
   b. Lumber
   c. Wood sheet materials.
   d. Wood trim.
   e. Metals.
   f. Roofing.
   g. Insulation.
   h. Carpet and pad.
   i. Gypsum board.
   j. Piping.
   k. Electrical conduit.
   l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or 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.

1.6 ACTION SUBMITTALS

A. Waste Management Plan (WMP): Submit plan within 14 days of date established for the Notice to Proceed.

1.7 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit a form completed and/or provided by the Waste Management Facility**.** Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons (tonnes).
4. Quantity of waste salvaged, both estimated and actual in tons (tonnes).
5. Quantity of waste recycled, both estimated and actual in tons (tonnes).
6. Total quantity of waste recovered (salvaged plus recycled) in tons (tonnes).
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

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

C. 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.

D. 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.

E. Qualification Data: For waste management coordinator and refrigerant recovery technician.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Construction Waste Diversion Reports: Monthly with pay applications, submit a record from the Waste Management companies/hauler detailing the total project waste, BY MATERIAL and measured in TONS, and depicting the overall trash, and material diversion rates for the project.

1.8 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Refer to section 01 81 13.54 Sustainable Design Requirements – Green Globes.

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

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

D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "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.

1.9 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan. Plan shall be submitted to the Architect as a required by Specification Section 018113.54, Sustainable Design Requirements, Green Globes 2021, requirements submittal at the beginning of construction.

B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Use Form CWM-7 (attached) for construction and demolition waste or standard form as provided by contracted Waste Management facility. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, 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 where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. 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 operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within seven 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 salvage, 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 salvaged, recycled, reused, donated, and sold.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

E. Waste Management in Historic Zones or Areas: Hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings.

F. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

G. Plumbing Fixtures: Separate by type and size.

H. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

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 Owner.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until 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 from Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING DEMOLITION WASTE

3.4 Paragraphs in this article are examples only; retain or add other specific disposal, cleanup, or removal requirements to suit Project or recycling facilities. Ceramic tile is also often recycled.

A. Asphalt Paving: Grind asphalt to maximum 4-inch (38-mm) size.

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

1. Pulverize concrete to maximum 4-inch (100-mm) size.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 4-inch (100-mm) size.
2. Clean and stack undamaged, whole masonry units on wood pallets.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

G. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 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. 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.

a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, 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: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 01 74 19

SECTION 01 77 00 - CLOSEOUT PROCEDURES

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. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 017300 "Execution" for progress cleaning of Project site.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
2. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
3. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by CM@R. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain CM@R’s signature for receipt of submittals.

C. Inspection: Submit a written request for inspection to determine Substantial Completion prior to date the work will be completed and ready for final inspection and tests to the CM@R. CM@R is to first meet with subcontractor to determine if the work is complete. On receipt of request from CM@R, Architect will either proceed with inspection or notify CM@R of unfulfilled requirements.

1. When the Architect proceeds with producing a punch list, the architect has acknowledged that a particular portion of the work is Substantial Completion.
2. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
3. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect[and Construction Manager] 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.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order.
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 CM@R.
    d. Name of Architect.
    e. Name of Contractor.
    f. Page number.

4. Submit list of incomplete items in a format that is agreeable to the Architect on the CM@R’s web based construction management software.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

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

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) 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.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

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.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
    1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
q. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

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. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Section 019113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Provide one copy to the Architect for review. Architect will return reviewed copy. Updated all three copies based on comments and provide all three copies to the owner

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.

1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. 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.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) 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. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.

4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.

3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. 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 MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

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

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

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. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."

G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

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. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for general closeout procedures.

1.3 CLOSEOUT SUBMITTALS

Record Documentation: For all work performed under the CCO 10, submit record drawings, specifications, product data, miscellaneous submittals and reports to CM@R for inclusion in final set of Record Documents that the CM@R will turn over to Clemson University at the completion of the entire Douthit Hills Student Community Construction project. Submit documents to the CM@R in a format that meets the CM@R's requirements.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper or electronic copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Locations and depths of underground utilities.
d. Revisions to routing of piping and conduits.
e. Revisions to electrical circuitry.
f. Actual equipment locations.
g. Changes made by Change Order or Construction Change Directive.
h. Changes made following Architect's written orders.
i. Details not on the original Contract Drawings.
j. Field records for variable and concealed conditions.
k. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints or electronic files.
4. Mark record sets with erasable, red-colored pencil if prints are used, or with a program that can be further edited if electronic files are used. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Substantial Completion, review marked-up record prints or electronic files with CM@R in a manner that meets the CM@R's requirements.
1. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
2. Refer instances of uncertainty to CM@R and Architect for resolution.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
2. Identification: As follows:

a. Project name.
b. Date.

c. Designation "PROJECT RECORD DRAWINGS."
d. Name of CM@R.
e. Name of Architect
f. 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: CM@R shall maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: CM@R shall store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

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. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For facilitator or instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.

b. Name and address of videographer.
c. Name of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Date of video recording.

2. Transcripts:

a. Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
b. Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.

3. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "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.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

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

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.

c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

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. 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 CM@R with at least fourteen days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

a. Name of Contractor/Installer.
b. Business address.
c. Business phone number.
d. Point of contact.
e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

a. Produce segments to present a single significant piece of equipment per segment.
b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded or by dubbing audio narration off-site after video recording. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 79 00

SECTION 01 81 13.54 - SUSTAINABLE DESIGN REQUIREMENTS - GREEN GLOBES 2021

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: General requirements and procedures for compliance with and certification from the GBI's "Green Globes for New Construction 2021," (hereafter, "Green Globes").

1. Some Green Globes requirements depend on product selections and may not be specifically identified as Green Globes requirements. Compliance with Green Globes requirements may be used as one criterion to evaluate substitution requests and comparable product requests.
2. A copy of Green Globes Project checklist is attached at end of this Section for information only. The Green Globes Project Administrator will provide checklist, actively tracking progress, throughout the project duration.

1.2 DEFINITIONS

A. Environmental Product Declaration (EPD): A transparency reporting tool communicating what a product is made of and the environmental impact.

B. REL: Recommended exposure limit.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at through video conference. Review Green Globes requirements and action plans for compliance with requirements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Respond to questions and requests from Architect about Green Globes requirements that are Contractor's responsibility, that depend on product selection or product qualities, or that depend on Contractor's procedures.

B. Environmental Management System: Document the following:

1. General Contractor's environmental policy.
2. Regulatory compliance and training.
3. Environmental risk assessment that shows sensitive environmental areas and ranks potential risks that may arise from the construction.
4. Environmental risk management strategies.
5. Environmental management roles, responsibilities, and reporting structure for the construction phase.

6. Site and work instructions for site personnel outlining environmental procedures during construction.
7. Environmental inspection checklists.
8. Records of compliance.

1.5 ACTION SUBMITTALS

A. General: Submit additional sustainable design submittals required by other Sections.

B. Sustainable design submittals are to be included as part of product submittals.

C. Sustainable Design Documentation Submittals:

1. Environmental management system documents.
2. EPDs.
3. Third-party certifications based on multiple attribute standards.
4. Third-party-certified life-cycle product assessments.
5. Documentation complying with Section 01 74 19 "Construction Waste Management and Disposal."
6. Product Data and laboratory test reports for adhesives and sealants indicating VOC content and compliance with requirements for low-emitting materials.
7. Certificates for carpet and undercarpet adhesives indicating compliance with CRI's Green Label Plus testing program.
8. Product Data and laboratory test reports for paints indicating VOC content and compliance with requirements for low-emitting materials.
9. Laboratory test reports for flooring, insulation, acoustical ceilings, and wall coverings, indicating compliance with requirements for low-emitting materials.
10. Indoor-Air-Quality (IAQ) testing report from testing and inspecting agency indicating results of IAQ testing and documentation that show compliance with IAQ testing procedures and requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Project Materials Cost Data: Provide statement indicating total cost for materials used for Project. Costs exclude labor, overhead, and profit. Include breakout of costs for the following categories of items:

1. Plumbing.
2. Mechanical.
3. Electrical.
4. Specialty items such as elevators and equipment.
5. Wood-based construction materials.

B. Sustainable Design Action Plans: Provide preliminary submittals within 14 days of date established for the Notice to Proceed, indicating how the following requirements will be met:

1. List of proposed products with EPDs.
2. List of proposed products complying with requirements for multiple attribute standards.

3. List of proposed products complying with requirements for life-cycle product assessments.
4. General Contractor's environmental policy.
5. Waste management plan complying with Section 01 74 19 "Construction Waste Management and Disposal."
6. Construction IAQ management plan.

C. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with sustainable design action plans. Architect reserves the ability to withhold Application for Payment until Sustainable Design Progress Reports are submitted.

D. Qualification Statements: For Green Globes coordinator.

1.7 QUALITY ASSURANCE

A. Green Globes Coordinator: Engage an experienced coordinator to coordinate Green Globes construction requirements. Green Globes coordinator may also serve as waste management coordinator. Green Globes Coordinator is prohibited from holding dual rolls on the project such as but not limited to project manager, assistant project manager, project engineer, or superintendent.

1. Green Globes coordinator to have previously coordinated at least one Green Globes project

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide products and procedures necessary to comply with Green Globes requirements referenced in this Section. Although other Sections may specify some requirements that contribute to referenced Green Globes requirements, Contractor will determine additional materials and procedures necessary to comply with Green Globes requirements indicated.

2.2 LOW-EMITTING MATERIALS

A. Adhesives and Sealants:

1. For field applications inside the building, adhesives and sealants to comply with the following VOC content limits:

a. Wood Glues: 30 g/L.
b. Metal-to-Metal Adhesives: 30 g/L.
c. Adhesives for Porous Materials (except Wood): 50 g/L.
d. Subfloor Adhesives: 50 g/L.
e. Plastic Foam Adhesives: 50 g/L.

f. Carpet Adhesives: 50 g/L.
g. Carpet Pad Adhesives: 50 g/L.
h. VCT and Asphalt Tile Adhesives: 50 g/L.
i. Cove Base Adhesives: 50 g/L.
j. Gypsum Board and Panel Adhesives: 50 g/L.
k. Rubber Floor Adhesives: 60 g/L.
l. Ceramic Tile Adhesives: 65 g/L.
m. Multipurpose Construction Adhesives: 70 g/L.
n. Fiberglass Adhesives: 80 g/L.
o. Contact Adhesive: 80 g/L.
p. Structural Glazing Adhesives: 100 g/L.
q. Wood Flooring Adhesive: 100 g/L.
r. Single-Ply Roof Membrane Adhesive: 250 g/L.
s. Special-Purpose Contact Adhesive (Contact Adhesive That Is Used to Bond Melamine Covered Board, Metal, Unsupported Vinyl, Rubber, or Wood Veneer 1/16 Inch or Less in Thickness to Any Surface): 250 g/L.
t. Plastic Cement Welding Compounds: 250 g/L.
u. ABS Welding Compounds: 325 g/L.
v. CPVC Welding Compounds: 490 g/L.
w. PVC Welding Compounds: 510 g/L.
x. Adhesive Primer for Plastic: 550 g/L.
y. Architectural Sealants: 250 g/L.
z. Nonmembrane Roof Sealants: 300 g/L.
aa. Single-Ply Roof Membrane Sealants: 450 g/L.
bb. Other Sealants: 420 g/L.

2. For field applications inside the building, adhesives and sealants may contain no more than half of the chronic REL of VOCs when tested in accordance with the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde may not exceed half of the indoor REL or 16.5 mcg/cu. m and that of acetaldehyde may not exceed 9 mcg/cu. m.

B. Carpet and undercarpet adhesives to comply with CRI's Green Label Plus testing program.

C. Paints:

1. For field applications inside the building, wall paints to comply with the following VOC content limits:

a. Latex Flat Paints: 50 g/L.
b. Latex Nonflat Paints: 150 g/L.

2. For field applications inside the building, wall paints may contain no more than half of the chronic REL of VOCs when tested in accordance with the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde may not exceed half of the indoor REL or 33 mcg/cu. m and that of acetaldehyde may not exceed 9 mcg/cu. m.

D. Flooring and Other Interior Products: Flooring, floor coverings, insulation, acoustical ceilings, and wall coverings may contain no more than half of the chronic REL of VOCs when tested in accordance with the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde may not exceed half of the indoor REL or 33 mcg/cu. m and that of acetaldehyde may not exceed 9 mcg/cu. m.

PART 3 - EXECUTION

3.1 CONSTRUCTION WASTE MANAGEMENT

A. Comply with Section 01 74 19 "Construction Waste Management and Disposal."

3.2 INDOOR-AIR-QUALITY (IAQ) ASSESSMENT

A. Air-Quality Testing: Engage a qualified testing agency to perform the following:

1. Conduct baseline IAQ testing, after construction ends and prior to occupancy, in accordance with the EPA's "Testing for Indoor Air Quality - Section 01 81 09."
2. Indoor air to comply with standards and limits in the EPA's "Testing for Indoor Air Quality - Section 01 81 09."
3. For each sampling point where the maximum concentration limits are exceeded, take corrective action until requirements have been met.
4. If any noncompliant test results occur, provide a written report describing the source(s) of the noncompliant condition(s) and the corrective action(s) implemented.

3.3 CLOSEOUT ACTIVITIES

A. Site Visit: Arrange for a site visit from Green Globes Assessor to verify compliance with requirements. Cooperate with Green Globes Assessor and provide reasonable auxiliary services as requested. Notify Green Globes Assessor sufficiently in advance of operations to permit assignment of personnel. Provide access to the Work and incidental labor and facilities necessary to facilitate inspections.

END OF SECTION 01 81 13.54

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

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.

B. A draft Commissioning Plan documentation is included by reference for information only.

1.2 SUMMARY

A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.

B. Related Sections:

Section 018113 “Sustainable Design Requirements” for Green Globes reporting requirements related to commissioning.

Section 220800 "Commissioning of Service Water Heating Systems” for commissioning process activities for Service Water Heating Systems, assemblies, equipment, and components.

Section 230800 "Commissioning of HVAC" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.

Section 260800 "Commissioning of Lighting Control Systems" for commissioning process activities for Lighting Control Systems, assemblies, equipment, and components.

1.3 DEFINITIONS

A. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

C. CxA: Commissioning Authority.

D. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

F. Resolution Tracking Form (RTF or Issues Log): A document that lists all issues identified during the

commissioning process including, but not limited to, issue number, date identified, description of the issue, party who identified the issue, party assigned to resolve the issue, issue resolution and verification that issue has been resolved and the date the issue was resolved.

1.4 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:
1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner has engaged the CxA under a separate contract with the Architect.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
1. Evaluate performance deficiencies identified in test reports and, in collaboration with the entity(ies) responsible for system and equipment installation, recommend corrective action.
2. Cooperate with the CxA for resolution of issues recorded in the Resolution Tracking Form (Issues Log).
3. Attend commissioning team meetings held on a variable basis.
4. Integrate and coordinate commissioning process activities with construction schedule.
5. Complete construction checklists (Pre-Functional Test Checklists, manufacturer and contractor startup sheets and checklists, test reports, TAB reports, etc.) as Work is completed and provide to the Commissioning Authority on a weekly basis or other schedule as mutually agreed to at the Pre-commissioning meeting.
6. Review and accept commissioning process test procedures (Functional Performance Tests) provided by the CxA.
7. Prepare and submit the Certificate of Readiness to the CxA prior to Functional Performance Testing.
8. Complete commissioning Functional Performance Testing procedures.

9. Provide documentation (agendas, sign-in sheets, minutes and related information) of all required training for systems that are being commissioned to the CxA and invite the CxA to all training sessions.

1.7 CxA'S RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Provide draft initial commissioning plan and update throughout project.

C. Convene commissioning team meetings.

D. Provide Project-specific construction checklists and commissioning process test procedures to the Contractor for completion and incorporation into the Work of the Project.

E. Verify the completion of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Resolution Tracking Form (Issues Log).

F. Prepare and maintain the Resolution Tracking Form (Issues Log).

G. Witness systems, assemblies, equipment, and component startup using random sampling.

H. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF SYSTEMS TO BE COMMISSIONED

A. The systems outlined in 3.1.B-3.1.D are to be commissioned as they apply to the following buildings:
1. Office Building
2. Facilities Shops and Asset Management Building
3. Public Works Shops
4. Sheds

B. HVAC&R Systems
1. Building Heating and Cooling Systems
2. Pumps
3. Dedicated Outdoor Air Units
4. Air Handling Units
5. Exhaust Fans
6. Electric Unit Heaters
7. Variable Frequency Drives
8. Terminal Units / VAV Devices
9. Duct, Air Distribution Devices, Grilles, Registers and Diffusers

10. Piping
11. Air Filtration Systems
12. Instrumentation and Controls
13. Building Automation System

C. Service Water Heating Systems
1. Water Heaters
2. Hot water recirculation pumps
3. Piping
4. Fixtures
5. Instrumentation and Controls
6. Integration with Building Automation System

D. Lighting Control Systems
1. Lighting Control Panels
2. Daylight Harvesting
3. Sensors
4. Switches
5. Wiring
6. Safeties
7. Fixtures
8. Integration with Building Automation System

CONTRACTOR'S CERTIFICATE OF READINESS
FOR COMMISSIONING FUNCTIONAL PERFORMANCE TESTING

It is the responsibility of the Contractor to verify the following pre-requisite items are complete in preparation for the Commissioning Authority (CxA) to perform Functional Testing. Every item on this list must be initialed and a signed copy must be received by the CxA prior to arriving on the job site. Please read thoroughly, initial next to the item below and sign as requested.

Initial each item below:

_____I verify that the system(s) to be commissioned, including all ductwork, piping, electrical, plumbing, and interfaces to other systems is complete and installed. Issues previously identified by the CxA that could prevent Functional Testing have been resolved.

_____I verify that all manufacturers' field services, factory representative tests and inspections, and factory authorized startup services have been completed as specified and that reports documenting the results of these services have been provided to the CxA.

_____I verify that for HVAC and Plumbing systems, all duct pressure testing, duct cleaning, pipe pressure testing, and pipe flushing has been completed in accordance with the Contract Documents

_____I verify that for HVAC and Domestic Hot Water systems, all Test and Balance work is complete and all issues that could impact Functional Performance Testing have been corrected and that the CxA has been provided with a TAB report.

_____I verify that the systems being testing are online and communicating with the BAS system.

_____I verify that the BAS contractor has completed the calibration of sensors and has completed point to point checks of all sensors and devices.

_____I verify that the BAS contractor has completed checks of all devices (dampers, control valves, etc.) for proper operation, fail position, and verification of no leakage.

_____I verify that they BAS contractor has completed a check of graphics and/or can provide the necessary reports exported from the BAS to confirm testing results.

_____I verify that the BAS contractor has programmed the system for all sequences of operation, set points, alarms, and occupancy schedules.

_____I verify that the BAS system is interfaced with all other systems that require Functional Performance Testing.

_____I verify that I have reviewed the scheduled list of activities on the days that Functional Performance Testing is to take place and made the necessary notifications and coordination to ensure there are no restrictions to testing.

Print Name, Title & Company _____

I understand that if the system(s) listed are not properly prepared for Functional Performance Testing as verified above, necessitating one or more return visits, the Contractor may be charged for additional services.

Signature_____ **Date**_____

SECTION 02 41 19 - SELECTIVE DEMOLITION

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
3. Section 017300 "Execution" for cutting and patching procedures.
4. Section 013516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
5. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Interruption of utility services **of adjacent buildings**. Indicate how long utility services will be interrupted.
2. Coordination for shutoff, capping, and continuation of utility services.

C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

D. 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.

E. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

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

1.9 FIELD CONDITIONS

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

1. Before selective demolition, Owner will remove the following items:

a. All furniture and equipment. What is left is behind is to be removed by the contractor.

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

C. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.

a. Refer to SM&E Hazardous Materials and Abatement Design for Manning Hall – Clemson University to be issued January, 2024.
b. *Specification Section 02 28 33 REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS* to be issued January, 2024.

2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

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.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

1. Existing warranties would apply to new equipment recently installed by Clemson that are to remain.

B. Notify warrantor on completion of selective demolition and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PERFORMANCE 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/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

B. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

C. Survey of Existing Conditions: Record existing conditions by means of Drone Deploy or other similar methods.

1. Inventory and record the condition of items to be removed and salvaged.
2. Developed measured electronic drawing files to confirm existing conditions as need for critical dimensions for new construction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

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

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, 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.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. 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. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. 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.
5. Maintain fire watch during and for at least 2 hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly. **Comply with requirements in Section 017419 "Construction Waste Management and Disposal."**

B. 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.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Protect items from damage during storage.
3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Remove Concrete by one of the following techniques as is appropriate for the building conditions:
   1. Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
   2. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings”

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Division 7 for new roofing requirements.

   1. Remove existing roof membrane, flashings, copings, and roof accessories.
   2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."

   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 Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

B. Related Sections include the following:

1. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.

1.3 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mix water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Cementitious materials and aggregates.
2. Form materials and form-release agents.
3. Steel reinforcement and reinforcement accessories.
4. Admixtures.
5. Curing materials.
6. Floor and slab treatments.
7. Waterstops
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Epoxy joint filler.
12. Joint-filler strips.

13. Repair materials.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. 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 formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.

C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

F. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

G. ACI Publications: Comply with the following, unless more stringent provisions are indicated:

1. ACI 301, "Specification for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

H. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Plain-Steel Wire: ASTM A 82, as drawn.

D. Deformed-Steel Wire: ASTM A 496.

E. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's

"Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

C. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I/II.

B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
1. Nominal Maximum Aggregate Size: 1 inch.

C. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

G. Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Catexol 1000CL; Axim Concrete Technologies.
b. MCI 2000 or MCI 2005; Cortec Corporation.
c. DCI or DCI-S; W. R. Grace & Co., Construction Products Div.
d. Rheocrete 222+; Master Builders, Inc.
e. FerroGard-901; Sika Corporation.

2.6 VAPOR RETARDERS

A. Vapor Retarder: ASTM E 1745, Class C, not less than 15 mils thick

1. Nonwoven, polyester-reinforced, polyethylene coated sheet; 15 mils (0.38 mm) thick.

2.7 FLOOR AND SLAB TREATMENTS

A. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

B. Clear, Waterborne, Epoxy Sealer:

1. Products:

a. Euclid Chemical Company (The); Eucopoxy Tufcoat VOX.
b. Nox-Crete Products Group; Dauerseal 30E.
c. Tamms Industries, Inc.; Dural WB 356.

2.8 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Flat, dumbbell without center bulb
2. Dimensions: 4 inches by 3/16 inch thick; nontapered.

B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

1. Profile: Flat, dumbbell without center bulb.
2. Dimensions: 4 inches by 3/16 inch thick; nontapered.

C. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Flat, dumbbell with center bulb
2. Dimensions: 4 inches by 3/16 inch thick; nontapered.

D. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

G. Do not use curing materials in areas where a floor finish of Mondo Terranova flooring is scheduled. A wet cure is required for these areas.

H. Products: Subject to compliance with requirements, provide one of the following:

1. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound:

a. Spray-Cure & Seal Plus; ChemMasters.
b. UV Super Seal; Lambert Corporation.
c. Lumiseal Plus; L&M Construction Chemicals, Inc.
d. CS-309/30; W. R. Meadows, Inc.
e. Seal N Kure 30; Metalcrete Industries.
f. Rich Seal 31 percent UV; Richmond Screw Anchor Co.
g. Cure & Seal 31 percent UV; Symons Corporation.
h. Certi-Vex AC 1315; Vexcon Chemicals, Inc.

2. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound:

a. Klear-Kote Cure-Sealer-Hardener, 30 percent solids; Burke Group, LLC (The).
b. Polyseal WB; ChemMasters.
c. UV Safe Seal; Lambert Corporation.
d. Lumiseal WB Plus; L&M Construction Chemicals, Inc.
e. Vocomp-30; W. R. Meadows, Inc.
f. Metcure 30; Metalcrete Industries.
g. Vexcon Starseal 1315; Vexcon Chemicals, Inc.

2.10 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.

C. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

D. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.

E. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

F. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5700 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Footings, Foundation Walls, and Piers: Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 Days): As indicated on drawings.
2. Maximum Slump: 4 inches.
3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch slump.

D. Slab-on-Grade and Elevated Slabs: Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 Days): As indicated on Drawings.
2. Maximum Slump: 5 inches.

E. Maximum Water-Cementitious Materials Ratio: 0.50 for concrete required to have low water permeability.

F. Maximum Water-Cementitious Materials Ratio: 0.45 for concrete exposed to deicers or subject to freezing and thawing while moist (exterior slab on grade).

G. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 2 to 4 percent, unless otherwise indicated.

H. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
1. Air Content: 6 percent for 1-inch- nominal maximum aggregate size.
2. Air Content: 6 percent for 3/4-inch- nominal maximum aggregate size.

I. Do not air entrain concrete to trowel-finished interior floor slabs. Do not allow entrapped air content to exceed 3 percent.

J. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

K. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class C, 1/2 inch.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor bolts, accurately located, to elevations required.
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, shelf angles, and other conditions.

3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

3.4 VAPOR RETARDERS

A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.

1. All small penetrations shall be sealed with Stego Mastic by Stego Industries, LLC (or approved equal).

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least two mesh spacings. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire. Concrete block supports are acceptable at foundation footings and slabs.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated.

1. Use dowel sleeves or lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301. Water may only be added at Project site if the batch ticket indicates that water was withheld at the plant for the express purpose of adding the water at the site.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to

consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.

1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
2. Do not apply rubbed finish to smooth-formed finish.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Initial Float: Use bull floats or darbies to form uniform and open textured surface area free of lumps, humps, divots and hollows.

C. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.

1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.

D. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

E. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
2. For slab on grade, finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:
   a. Specified overall values of flatness, F_F25; and levelness, F_L20; with minimum local values of flatness, F_F17; and levelness, F_L15.

F. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

G. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

H. Slip-Resistive Aggregate Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:

1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
2. After broadcasting and tamping, apply float finish.
3. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose slip-resistive aggregate.

I. Flatness: Contractor to finish and measure surface so that a gap at any point between concrete surface and unleveled freestanding 10 foot long straightedge resting on two high spots and placed anywhere on surface shall not exceed 3/16 inch.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.11 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after

loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 LIQUID FLOOR TREATMENTS

A. Epoxy Sealer Coat: At locations indicated to receive sealer, uniformly apply a continuous epoxy sealing coat to hardened concrete according to manufacturer's written instructions.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place

patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

3.15 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
   4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
   5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
      a. Cast and field cure one set of four standard cylinder specimens for each composite sample.
   6. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days and two at 28 days and one at 56 days.
      a. Test one field-cured specimen at 7 days and two at 28 days and one at 56 days.
      b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days,

concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 03 30 00

SECTION 03 53 00 - CONCRETE TOPPING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete floor topping.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each concrete floor topping, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C1077 and ASTM E329 for testing indicated.

B. Mockups: Place concrete floor topping mockups to demonstrate typical joints, surface finish, bonding, texture, tolerances, and standard of workmanship.

1. Build mockups approximately 100 sq. ft. in the location indicated or, if not indicated, as directed by Architect.

2. If Architect determines that mockups do not meet requirements, demolish and remove them from the site and cast others until mockups are approved.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete floor topping performance.

1. Place concrete floor topping only when ambient temperature and temperature of base slabs are between 50 and 86 deg F (10 and 30 deg C).

B. Close areas to traffic during topping application and, after application, for time period recommended in writing by manufacturer.

PART 2 - PRODUCTS

2.1 CONCRETE FLOOR TOPPINGS

A. Concrete Floor Topping: Factory-prepared and dry-packaged self-leveling re-surfacing compound to which only water needs to be added at Project site.

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. Euclid Chemical Company (Basis of design): “Level Top Polish, Polishable Self-Leveling Overlayment.”
b. Mapei.

2. Compressive Strength (28 Days): 7,000 psi, ASTM C109/C109M.

3. Unit Weight: 134 lb/ft^3.

4. Set Time:

a. Initial: 50 to 80 minutes, ASTM C191.
b. Final: 100 to 180 minutes, ASTM C191.

2.2 BONDING AGENTS

A. Bonding Agent: Liquid latex bonding agent for cement-based repair mortars and concrete.

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. Euclid Chemical Company (Basis of design): “Eucoweld 2.0 Latex Bonding Agent.”
b. Mapei.

2. ASTM C1059, Type II.
3. Direct Tension Bond Strength (7 Days): 370 psi, ASTM C1583.
4. Slant Shear Bond Strength:

a. 14 Days, Dry Conditioned: 2730 psi, ASTM C882.
b. 14 Days, Wet Conditioned: 2760 psi, ASTM C882.

2.3 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

2.4 RELATED MATERIALS

A. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids epoxy resin with a Type A Shore durometer hardness of 80 according to ASTM D2240.

B. Water: Potable.

C. Epoxy Adhesive: ASTM C881/C881M, Type V, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements.

2.5 MIXING

A. Floor Topping: Mix concrete floor topping materials and water in accordance with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of the Work.

B. Verify surface treatments containing hazardous materials have been abated prior to beginning work of this section. Advise Owner and Architect in writing of any existing remaining surface treatments containing hazardous materials.

C. Verify that base concrete slabs comply with scratch finish requirements specified in Section 03 30 00 "Cast-in-Place Concrete."

D. Verify that base slabs are visibly dry and free of moisture. Test for capillary moisture by the plastic sheet method according to ASTM D4263.

E. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch.

1. Prepare and clean existing base slabs according to concrete floor topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.
2. Mechanically remove contaminants from existing concrete that might impair bond of floor topping.
3. Saw cut contraction and construction joints in existing concrete to a depth of 1/2 inch and fill with semirigid joint filler.
4. To both sides of joint edges and at perimeter of existing base slab, mechanically remove a 4-inch-wide and 0- to 1-inch-deep, tapered wedge of concrete and retexture surface.

B. Install joint-filler strips where topping abuts vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with topping surface unless otherwise indicated.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

C. Install power-actuated fasteners according to written directions of floor topping manufacturer at perimeter of areas that are to receive floor topping, including both edges of locations where joints will be formed in floor topping.

3.3 FLOOR TOPPING APPLICATION

A. Start floor topping application in presence of manufacturer's technical representative.

B. Existing Concrete: Apply epoxy-bonding adhesive, mixed according to manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch, without puddling. Place floor topping while adhesive is still tacky.

C. Place concrete floor topping continuously in a single layer, tamping and consolidating to achieve tight contact with bonding surface. Do not permit cold joints or seams to develop within pour strip.

1. Screed surface with a straightedge and strike off to correct elevations.
2. Slope surfaces uniformly where indicated.
3. Begin initial floating, using bull floats to form a uniform and open-textured surface plane free of humps or hollows.

D. Finishing: Consolidate surface with power-driven floats as soon as concrete floor topping can support equipment and operator. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until concrete floor topping surface has a uniform, smooth, granular texture.

1. Hard Trowel Finish: After floating surface, apply first trowel finish and consolidate concrete floor topping by power-driven trowel without allowing blisters to develop. Continue troweling passes and restraighten until surface is smooth and uniform in texture.

a. Finish surfaces to specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15, and measure within 24 hours according to ASTM E1155 (ASTM E1155M) for a randomly trafficked floor surface.
b. Finish and measure surface, so gap at any point between surface and an unleveled freestanding 10-foot-long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 1/4 inch.

E. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of concrete floor topping, at locations indicated or as approved by Architect.

1. Coat face of construction joint with epoxy adhesive at locations where concrete floor topping is placed against hardened or partially hardened concrete floor topping.

F. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete floor topping when cutting action will not tear, abrade, or otherwise damage surface and before random contraction cracks develop.

1. Form joints in concrete floor topping over contraction joints in base slabs unless otherwise indicated.
2. Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness.
3. Construct contraction joints for a depth equal to one-half of concrete floor topping thickness, but not less than 1/2 inch deep.

3.4 PROTECTING AND CURING

A. General: Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures.

B. Evaporation Retarder: Apply evaporation retarder to concrete floor topping surfaces in hot, dry, or windy conditions before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying floor topping, but before float finishing.

C. Begin curing immediately after finishing concrete floor topping. Cure by one or a combination of the following methods, according to concrete floor topping manufacturer's written instructions:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
2. Curing Compound: Apply uniformly in two coats in continuous operations by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.5 JOINT FILLING

A. Prepare and clean contraction joints and install semirigid joint filler, according to manufacturer's written instructions, once topping has fully cured.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth of contraction joints. Overfill joint and trim semirigid joint filler flush with top of joint after hardening.

3.6 REPAIR

A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of completed applications of concrete floor toppings to take place in successive stages, in areas of extent and using methods as follows:

1. Sample Sets: At point of placement, a set of three molded-cube samples to be taken from the topping mix for the first 1000 sq. ft., plus one set of samples for each subsequent 5000 sq. ft. of topping, or fraction thereof, but not less than six samples for each day's placement. Samples to be tested according to ASTM C109/C109M for compliance with compressive-strength requirements.
2. Concrete floor topping to be tested for delamination by dragging a steel chain over the surface.
3. Concrete floor topping to be tested for compliance with surface flatness and levelness tolerances.

C. Remove and replace applications of concrete floor topping where test results indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 03 53 00

SECTION 04 20 00 - UNIT MASONRY

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. Procedures for compliance with certain Green Building Initiative's (GBI) "Green Globes for New Construction, may apply to this Section.

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete Masonry Units
2. Face Brick
3. Mortar and grout.
4. Reinforcing steel.
5. Masonry joint reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Miscellaneous masonry accessories.
9. Cavity-wall insulation behind veneer

B. Related Sections include the following:

1. Division 07 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
2. Division 07 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.

C. Products installed, but not furnished, under this Section include the following:

1. Steel lintels for unit masonry, furnished under Division 05 Section “Structural Steel Framing”

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For the following:

1. Face brick, in the form of straps of five or more bricks.
2. Pigmented and Colored-Aggregate mortar in the form of actual mortar strips in metal frames. Make samples using same sand and mortar ingredients to be used on the project.

C. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

D. 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. Brick.

a. Include material test reports substantiating compliance with requirements.
b. For exposed brick, include material test report for efflorescence according to ASTM C 67.
c. Include data and calculations establishing average net-area compressive strength of units.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of product and for masonry units, include material test reports substantiating compliance with requirements.

B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Owner will engage an independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. 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.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

1. Mortar Test (Property Specification): For each mix required, per ASTM C 780.
2. Grout Test (Compressive Strength): 2500 psi.

D. Brick Veneer Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects, to demonstrate color matching of existing campus buildings and set quality standards for materials and execution.
   1. Build mockups to include each type of exposed brick veneer. 48 inches (1200 mm) long by 48 inches (1200 mm) high by full wythe thickness.
      a. Include up to three mockups in contractor's bid.
      b. Mockups to include the mortar with the selected color.
   2. **Build Brick Veneer Mockups and acquire approval of brick and mortar ahead of construction of Composite Mockup Panel indicated below.**
   3. Build mockup in location indicated by architect, adjacent and parallel to an exterior wall to one of the existing buildings.
   4. Clean exposed faces of mockups with masonry cleaner as indicated.
   5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar 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. Composite Mockup Panel: Construct one Composite Mockup Panel after approval of the brick and mortar color mockups. Refer to drawing A-AS1.1 for configuration of Composite Mockup Panel and for materials and construction to be provided.
   1. Locate Composite Mockup Panel where indicated by Architect and facing a southerly direction.
   2. Building mocks for brick and mortar in sizes and configuration indicated on drawing.
   3. Provide all the components that fall under the Unit Masonry specification that are indicated in the Composite Mockup Panel.
   4. Clean exposed faces of mockups with masonry cleaner specified.
   5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar; 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.

F. 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. 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 pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, 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.

1.7 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. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed clay mud and from mortar splatter by spreading coverings on ground and over wall surface, and covering bottom 2'-8" above finish floor with plastic sheets. Set plastic sheets in horizontal mortar joint and drape down face of wall and tucking plastic sheets under coverings on ground holding down plastic sheets with loose masonry and lapping joints 2 feet.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

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 use 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 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.3 CONCRETE MASONRY UNIT

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

B. Integral Water Repellent: Provide units made with integral water repellent.

C. CMUs: ASTM C90, normal weight unless otherwise indicated.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2650 psi.

D. Concrete Building Brick: ASTM C55, normal weight unless otherwise indicated.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4050 psi.

E. Concrete Face Brick: ASTM C1634, normal weight.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4050 psi.

2.4 LINTELS

A. Solid Concrete Masonry Lintels: ASTM C1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength of not less than that of CMUs.

B. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 032000 "Concrete Reinforcing," and with reinforcing bars indicated.

C. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 MORTAR AND GROUT MATERIALS FOR CMU

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content will not be more than 0.1 percent when tested in accordance with ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91/C91M.

E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

F. Aggregate for Mortar: ASTM C144.

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. White-Mortar Aggregates: Natural white sand or crushed white stone.

G. Aggregate for Grout: ASTM C404.

H. Water: Potable.

2.6 REINFORCEMENT FOR CMU

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M, Grade 60.

B. Masonry-Joint Reinforcement, General: ASTM A951/A951M.

1. Interior Walls: Hot-dip galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.148-inchdiameter.
4. Wire Size for Cross Rods: 0.148-inchdiameter.

C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

2.7 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for sill and corbelled bricks and for similar applications that would otherwise expose unfinished brick surfaces, provide units without exposed cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

B. Face Brick: Facing brick complying with ASTM C 216

1. Products: Subject to compliance with requirements, provide the following products:

a. Field brick color and texture: Refer to Exterior Building Finishes on A-A4-series drawings.
1. Size (Actual Dimensions): Modular 7-5/8” x 3-5/8” x 2-1/4”

2. Grade: SW
3. Type: FBS.
4. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."

2.8 MORTAR AND GROUT MATERIALS FOR BRICK VENEER

A. Masonry Cement: ASTM C 91 and ASTM C 270.

1. Available manufactures offering acceptable products include:

a. Capital Materials Corporation
b. Holcim (US) Inc.;
c. Lafarge North America Inc.;
d. Lehigh Cement Company;
e. National Cement Company, Inc.; Coosa Masonry Cement.

2. Pigments shall not exceed 5 percent of masonry cement by weight.
3. For colored-aggregate mortar, use natural color of white cement as necessary to produce required mortar color.
4. Mortar color: Refer to Exterior Building Finishes on A-A4-series drawings.

B. 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. White-Mortar Aggregates: Natural white sand or crushed white stone.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

C. Aggregate for Grout: ASTM C 404.

D. 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:

a. Addiment Incorporated; Mortar Kick.
b. Euclid Chemical Company (The); Accelguard 80.
c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
d. Sonneborn, Div. of ChemRex; Trimix-NCA.

E. Water: Potable.

2.9 REINFORCEMENT FOR BRICK VENEER

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Wire size for Brick Veneer at Metal Stud Back-up Exterior Walls: W1.7 or 0.148-inch (3.8-mm) diameter.

2.10 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, 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 (Z180) zinc coating.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.

C. Adjustable Masonry-Veneer Anchors

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs, and as follows:

   a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).

2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section for anchorage to Metal Stud Backup.

   a. Basis of Design Product:

      1) Hohman & Barnard, Inc Thermal 2-Seal Wing Nut Adjustable Veneer Anchor with self-drilling screw.

         a) Provide the basis of design product or an equal product meeting all the requirements indicated below, as determined by the Architect.
         b) Submit equal products to Architect for review and approval.

   b. Two Seal Design:

      1) Dual diameter barrel.
      2) Factory installed EPDM washer to seal the face of the air/vapor barrier at the face of the backup sheathing.
      3) Factory installed 1 1/2" diameter washer to seal the face of the insulation and to help secure the insulation to the backup and designed to not penetrate the face of the insulation.

   c. Projecting Thermal Wings:

      1) Thermal wings that are steel reinforced and coated with flame resistant plastic to create a thermal break, decreasing thermal transfer through rigid insulation.
      2) Wings that accept wire hook that rotate to easily orient pintles/hooks to masonry joints, and provide 1/2-inch of adjustability.

   d. Anchor Components and Barrel Materials:

1) Barrel: Dual Diameter Barrel. Stainless Steel, ASTM A580/A580M 0 AISI Type 304.

a) Provide barrel shaft to accommodate rigid insulation thickness and sheathing thickness over steel studs and provide screws to suit steel stud substrate with barrel shafts providing positive contact with steel studs.

2) Screw: ASTM A510 Carbon Steel, ASTM C954 (1000-hour polymer coating)
3) Masonry Tie Anchor: 2X-Hook, withstand 200-lb per liner foot in tension and compression at maximum allowable offset of 4 1/2-inch insulation and 2-inch air cavity space. Designed to be installed with legs pointing up or down.
   a) Wire: 3/16 inch (4.75 mm) minimum wire diameter. Carbon Steel, prefabricated from cold-drawn steel wire conforming to ASTM A1064/A1064M with tensile strength of 80,000 psi and a yield point of 70,000 psi minimum. Zinc Coating; hot-dip galvanized after fabrication, ASTM A153/A152M-B (1.5 oz/ft2).
   b) Designed to provide minimum 2 1/2 inches of embedment in mortar.

2.11 EMBEDDED FLASHING MATERIALS

A. Self-adhesive Composite Flexible Flashing: Self-adhesive cold-applied sheet consisting of 32 mils of rubberized asphalt integrally bonded to an 8 mil, high density, cross-laminated polyethylene film.

B. 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.

1. Meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168.

   a. Current VOC limit for contact adhesive: 250 grams of VOC per liter of adhesive.

2. Self-adhesive Composite Flexible Flashing: For use with exterior wall assemblies with metal stud and foam-plastic board insulation sheathing back-up behind masonry veneer walls:

   a. Dur-O-Barrier; Dur-O-Wal, Inc.
   b. Everlastic MF-400; Williams Products, Inc.
   c. Perm-A-Barrier Wall Flashing; W.R. Grace & Co., Construction Products Division
   d. Poly-Barrier Self-Adhering Wall Flashing; Polytite Manufacturing Corp.
   e. Polyguard 300; Polyguard Products, Inc.
   f. Textroflash; Hohmann & Bernard, Inc.Fabricate.

C. COLD WEATHER Through-Wall Flashing OPTION, APPROVED BY ARCHITECT: Manufacturer’s standard through-wall flashing of type indicated below:

1. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch (1.0 mm) thick.

    a. Use only where flashing is fully concealed in masonry.
    b. For use at exterior wall assemblies with brick veneers.
    c. Provide one of the following Products:

        1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
        2) Firestone Building Products; FlashGuard.
        3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.

D. Clear Plastic for Masonry Stain Prevention:

1. High density polyethylene (HDPE), 30 mils (0.8 mm) thick.

2.12 FOAM-PLASTIC BOARD INSULATION-SHEATHING FOR STEEL STUD CAVITY WALLS

A. Extruded-Polystyrene Board Insulation: ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:

B. Insulation shall be Styrofoam Cavitymate SC (extruded polystyrene) meeting ASTM C-578 Type X as manufactured by Dow Chemical or approved equal.

C. Insulation shall have shipped-lapped edges on the 8 foot sides.

D. Insulation shall be tested in accordance with NFPA 285, 1989 Edition (UBC 26.9, intermediate scale-multistory testing).

1. Manufacturers:

    a. The Dow Chemical Company. Thickness indicated on drawings

F. Joint Sealer and Adhesive: Great Stuff Pro Gaps and Crack Sealer by Dow Chemical.

G. Board Insulation Fasteners at Steel Stud Cavity Walls: Fasten the insulation through the sheathing and to the steel studs with the veneer anchor barrel screw shafts with thermal seal washers behind wing nut to receive veneer anchors.

2.13 MISCELLANEOUS MASONRY ACCESSORIES

A. Weep/Vent Products: Use the following, unless otherwise indicated:

1. Wicking Material: Absorbent rope, made from cotton or UV-resistant synthetic fiber, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity between wythes. Use only for weeps.

2.14 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

2.15 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. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated:

1. For masonry below grade or in contact with earth, use Type S
2. For conditions not otherwise indicated use Type S
3. For brick veneer above grade, use Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 601 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

2.16 SOURCE QUALITY CONTROL

A. Owner may 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.
3. Contractor is to also provide testing of Mortar and Grout to the extent the Contractor deems necessary to assure requirements of this specification are being met.

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 of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are

F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

G. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) 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 (1.5 mm) from one masonry unit to the next.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond and in bond patterns indicated on Drawings; do not use units with less than nominal 4-inch (100-mm) 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 (100-mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) 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. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING FOR CMU

A. Lay CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING FOR BRICK VENEER

A. 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.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.6 FOAM-PLASTIC BOARD INSULATION-SHEATHING FOR STEEL STUD CAVITY WALLS

A. Install boards horizontally on walls.

1. Attach boards with specified brick tie using appropriate spacing to comply with all codes.
2. Butt edges and ends tightly to adjacent boards and to protrusions and fill any gaps greater than 1/4 inch or any damage areas with Dow Great Stuff Pro foam
3. Provide sealant at any gaps between slab on grade edge (masonry edge at slab on grade perimeter) and board insulation.

B. Cut and fit insulation tightly to protrusions or interruption to the insulation plane.

3.7 CAVITY WALLS

A. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

3.8 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:

1. Self-Drilling Screw: Drill through the insulation and sheathing and into the metal stud in accordance with the manufacturers written instructions.
2. Configure ties to prevent flow of water to anchor and to transfer lateral loads without excess mechanical play or deformation.
3. Embed tie sections in masonry joints. Provide typically a minimum of 1 3/4 inches (50 mm) of air space between back of masonry veneer and face of sheathing or insulation and at no condition such as at the recessed brick veneer wall panels less than ¾” inch of air space between back of masonry veneer and face of sheathing or insulation
4. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
5. Space anchors as indicated, but not less than 16 inches (458 mm) o.c. vertically and 16 inches (610 mm) o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. (0.2 sq. m) of wall area. Install anchors typically 8” from bottom and top of veneer but not more than 12” from bottom and top of veneer when anchors are being located to avoid flashing or at other non-typical conditions.

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 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 (10 mm) for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches (200 mm) 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 masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing 8 inches (200 mm) above the weep height.**
3. **Transition Flashing Strip by Fluid Applied Membrane Air Barrier manufacturer to lap over top of thru-wall as detailed on drawings.**
4. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
5. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.
6. 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 product to form weep holes.
2. Space weep holes 24 inches (600 mm) o.c., unless otherwise indicated.
3. Cut rope weeps with face of brick after masonry is cleaned and architect has observed their installation.

3.12 MASONRY-JOINT REINFORCEMENT FOR CMU

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 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.

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 clean 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 for Brick Veneer:

1. One set of tests for each 5000 sq. ft. (465 sq. m) of wall area or portion thereof.
2. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for compressive strength.
3. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.
4. Prism Test: For each type of construction provided, per ASTM C 1314 at 7 days and at 28 days.

D. Testing Frequency for CMU:

1. One set of tests for each 5000 sq. ft. of wall area or portion thereof.
2. Concrete Masonry Unit Test: For each type of unit provided, in accordance with ASTM C140/C140M for compressive strength.
3. Mortar Test (Property Specification): For each mix provided, in accordance with ASTM C780. Test mortar for mortar air content and compressive strength.
4. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.

3.14 REINFORCED UNIT MASONRY

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 that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in 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 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.

3.15 REPAIRING, POINTING, CLEANING AND SEALING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

3.16 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 1 1/2 inches (100 mm) in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

SECTION 05 12 00 – STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes structural steel and architecturally exposed structural steel.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Quality Control" for independent testing agency procedures and administrative requirements.
2. Division 5 Section "Steel Deck" for field installation of shear connectors.
3. Division 5 Section "Metal Fabrications" for loose steel bearing plates and miscellaneous steel framing.
4. Division 9 Section "Painting" for surface preparation and priming requirements.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer structural steel connections required by the Contract Documents to be selected or completed by the fabricator to withstand design loadings indicated.

B. Engineering Responsibility: Engage a fabricator who utilizes a qualified professional engineer to prepare calculations, Shop Drawings, and other structural data for structural steel connections.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified.

C. Shop Drawings detailing fabrication of structural steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.

3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
4. Include Shop Drawings signed and sealed by a qualified professional engineer in the state of State of South Carolina responsible for their preparation.
5. Include connection design calculations signed and sealed by a qualified professional engineer in the state of South Carolina responsible for their preparation.

D. Qualification data for firms and persons specified in the "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.

E. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.

1. Structural steel, including chemical and physical properties.
2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Twist-off tension control bolts (load indicator bolts).
5. Shear stud connectors.
6. Shop primers.
7. Nonshrink grout.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work. Fabricator shall have a minimum of 10 years' continuous experience on projects of similar size and complexity and have AISC certification or a written statement from an approved special inspection agency that their quality control manual and the results of periodic auditing of fabrication practices and procedures comply with Chapter 17 of the applicable edition of the IBC.

1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant as follows:

   a. Category: Category I, conventional steel structures.

C. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

2. AISC's "Load and Resistance Factor Design (LFRD) Specification for Structural Steel Buildings."
3. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
4. AISC's "Specification for Load and Resistance Factor Design of Single-Angle Members."
5. AISC's "Seismic Provisions for Structural Steel Buildings."
6. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
7. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325."
8. Research Council on Structural Connections' (RCSC) "Load and Resistance Factor Design Specification for Structural Joints Using ASTM A 325."

D. Professional Engineer Qualifications: A professional engineer who is legally authorized to practice in the 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 projects with structural steel framing that are similar to that indicated for this Project in material, design, and extent.

E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel."

1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

F. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS “Standard Qualification Procedure” AWS D1.1.

1. Provide certification that both shop and field welders to be employed in work have satisfactorily passed AWS qualification tests within the previous 48 months.

G. Connections: As shown on final shop drawings. Use high-strength bolts for field connections, except as otherwise indicated. Unless otherwise noted, all beam connections shall be Standard Frames Connections as shown in part 4 of the AISC Manual of Steel Construction. Unless reactions are indicated on the plans, connections shall develop at least one half of the total uniform load capacity tabulated in part 2 of the AISC Manual of Steel Construction. In no case, however, shall the connections be less than one half the T dimensions.

1. Prior to fabricating any material, shop drawings must be reviewed by the Engineer. Paragraph 4.2.1 of Section 4, Code of Standard Practice for Steel Buildings and Bridges, (AISC) is hereby modified to delete the sentence, “This approval constitutes the Owner’s acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation to those in AISC’s “Structural Steel Detailing”.

H. Bracing: All bracing connections shall develop the greater of (1) The force indicated on the Drawings, (2) The allowable tension force in the member , or (3) The force required by AISC’s Seismic Provisions, if applicable, unless noted otherwise. A minimum of two bolts shall be used per connection unless otherwise noted. All bracing connections shall be designed and detailed so all force components will be transmitted directly to the centerline of the intersecting

members; where this is not possible, connections shall be designed for all resulting eccentricities.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.

1. At delivery and prior to unloading, examine all steel for signs of thin or no shop primer. If steel has numerous signs of improper packing, handling, or preparation, as evidenced by numerous breaks, chips, scratches, and heavily rusted areas in the shop primer, do not accept the steel. Where existing primer appears to be thin as evidenced by shadows or variegated appearance, or rust bloom, check thickness of primer with a magnetic thickness tester such as a Positester.

2. If unloaded, staged, or erected steel is found to have low shop-primer as described above, the Contractor shall be responsible for bringing the required surface preparation and priming to bring the shop primer thickness to the specified dry film thickness, even if the steel is erected.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Stack in such a manner that surface water will properly drain. If the materials are to be stored for an extended period of time, cover in such a way that rain will not fall on the material, but air will flow freely through the stack.
3. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.
4. Store steel so as to be protected from mud and dirt. Remove all traces of mud and dirt prior to erecting. Mud and dirt shall be removed carefully to prevent damage to the primer.

1.7 SEQUENCING

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel Shapes, Plates, and Bars: As indicated on Basis of Design drawing:

1. Carbon Steel: ASTM A 36.
2. High-Strength Steel: ASTM A 992.

B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.

C. Hot-Formed Structural Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Type E or S, Grade B.

1. Weight Class: Standard, unless noted.
2. Finish: Black, except where indicated to be galvanized.

E. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.

F. Anchor Rods, Bolts, Nuts, and Washers: As follows:

1. Unheaded Rods: ASTM A 36, unless noted.
2. Headed Bolts: ASTM A 307, Grade A; carbon-steel, hex-head bolts; and carbon-steel nuts.
3. Headed Bolts: ASTM A 325, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
4. Washers: ASTM A 36.

G. Nonhigh-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A; carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Plain, uncoated, unless noted.

H. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain, uncoated, unless noted.
2. Tension Control Bolts: ASTM A 325, Type 1, Heavy Hex Carbon-Steel Nuts, hardened carbon steel washers, and structural bolts with a notch between the bolt tap and threads. The bolt shall bedesigned to react to the opposing rational torques applied by the installation wrench, with the bolt tip automatically shearing off when the proper tension is obtained.

I. Welding Electrodes: Comply with AWS requirements.

2.2 PRIMER

A. Primer: Light gray alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS TT-P-664.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

2.4 FABRICATION

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

1. Camber structural steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6 and maintain markings until steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
5. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
6. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

B. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names, and roughness.

1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating, and shop priming.
2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.

C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded.

D. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.

E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer’s printed instructions.

F. Steel Wall Framing: Select true and straight members for fabricating steel wall framing to be attached to structural steel framing. Straighten as required to provide uniform, square, and true members in completed wall framing.

G. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members as shown on Shop Drawings.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning or by use of drift pins. Drill holes in bearing plates.
2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

2.5 SHOP CONNECTIONS

A. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
1. Bolts: ASTM A 325 high-strength bolts, unless otherwise indicated.
2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
1. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

2.6 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed-on fireproofing.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:
1. SSPC-SP 3 "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.7 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123, where indicated.

2.8 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop inspections and tests and to prepare test reports when work being completed in the shop requires inspection per the special inspections schedule for the project.

1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
2. Provide testing agency with access to places where structural steel Work is being fabricated or produced so required inspection and testing can be accomplished.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325."

E. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed at testing agency's option.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.

B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. 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.
3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

    a. Comply with manufacturer's instructions for proprietary grout materials.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

1. Maintain erection tolerances of architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection.

H. Finish sections thermally cut during erection equal to a sheared appearance.

I. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. Install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.
   1. Connection Type: Snug tightened for ASTM A 307 bolts. ASTM A 325 bolts shall be load indication bolts, “tension control bolts” in all high strength bolted connections.

B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

   1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
   2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch and larger. Grind flush butt welds. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.

   1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325."

   1. Direct-tension indicator gaps will be verified to comply with ASTM F 959, Table 2.

E. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1.

3.6 CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

   1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on structural steel are included in Division 9 Section "Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.

END OF SECTION 05 12 00

Section 053100 - STEEL DECKING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Roof deck.
2. Composite floor deck.

B. Related Requirements:
1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.2 ACTION SUBMITTALS

A. Product Data:
1. Roof deck.
2. Composite floor deck.

B. Shop Drawings:
1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates:
1. Welding certificates.
2. Product Certificates: For each type of steel deck.

B. Test and Evaluation Reports:
1. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   a. Power-actuated mechanical fasteners.
2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.

C. Field Quality-Control Submittals:
1. Field quality-control reports.

D. Qualification Statements: For **welding personnel and testing agency**.

1.4 QUALITY ASSURANCE

A. Qualifications:
1. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding codes:
   a. AWS D1.1/D1.1M.
   b. AWS D1.3/D1.3M.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 ROOF DECK

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:
   1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), **Grade 33**, **G60** zinc coating.
   2. Deck Profile: **As indicated**.
   3. Profile Depth: **As indicated**.
   4. Design Uncoated-Steel Thickness: **As indicated.**
   5. Span Condition: **As indicated**.

2.2 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with SDI C, with the minimum section properties indicated, and with the following:
   1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, **G60** zinc coating.
   2. Profile Depth: **As indicated**.
   3. Design Uncoated-Steel Thickness: **As indicated**.
   4. Span Condition: **Triple span or more**.

2.3 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

G. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, **0.0598 inch** thick, with factory-punched hole of 3/8-inch minimum diameter.

H. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

I. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

J. Galvanizing Repair Paint: **SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight**.

K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
   1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.3 INSTALLATION OF ROOF DECK

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
   1. Weld Diameter: **5/8 inch**, nominal.
   2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds **as indicated**.
   3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals as indicated on drawings.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
   1. End Joints: **Lapped 2 inches minimum**.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and **weld** flanges to top of deck. Space **welds** not more than 12 inches apart with at least one **weld** at each corner.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. **Weld** to substrate to provide a complete deck installation.

3.4 INSTALLATION OF FLOOR DECK

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
   1. Weld Diameter: **5/8 inch**, nominal.
   2. Weld Spacing:
      a. Space and locate welds as indicated.
   3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals as indicated.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of **1-1/2 inches**, with end joints as follows:
   1. End Joints: L**apped**.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure in accordance with SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, in accordance with SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

B. Repair Painting:
   1. Wire brush and clean rust spots, welds, and abraded areas on **top surface** of prime-painted deck immediately after installation, and apply repair paint.
   2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
   3. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
   4. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.6 FIELD QUALITY CONTROL

A. Testing Agency: **Owner will engage** a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:
   1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.
      a. Field welds will be subject to inspection.
   2. Steel decking will be considered defective if it does not pass tests and inspections.
   3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
      a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
      b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors that are already tested.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes, but is not limited to, the following:
   1. Exterior non-load-bearing curtain-wall framing.
   2. Ceiling joist framing.
   3. Exterior load-bearing curtain-wall framing
   4. Roof joist framing
   5. Interior non-load-bearing wall framing

B. Related Sections include the following:

   1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
   2. Division 6 Section "Rough Carpentry" for subflooring, wall sheathing, or roof sheathing using wood-based structural-use panels, particleboard, fibrous-felted board, and foam-plastic sheathing.
   3. Division 9 Section "Gypsum Board Assemblies" for interior non-load-bearing metal-stud framing and ceiling-suspension assemblies.

1.3 DEFINITIONS

A. Minimum Uncoated Steel Thickness: Minimum uncoated thickness of cold-formed framing delivered to the Project site shall be not less than 95 percent of the thickness used in the cold-formed framing design. Lesser thicknesses shall be permitted at bends due to cold forming.

B. Producer: Entity that produces steel sheet coil fabricated into cold-formed members.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

   1. Design Loads: As indicated.

      a. Dead Loads: Weights of materials and construction.

b. Live Loads: As indicated.
c. Roof Loads: As indicated.
d. Snow Loads: As indicated.
e. Wind Loads: As indicated.
f. Earthquake Loads: As indicated.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Exterior Non-Load-Bearing Curtain-Wall Framing: Horizontal deflection of 1/360 of the wall height.
   b. Exterior Non-Load-Bearing Brick Veneer-Wall Framing: Horizontal deflection of 1/600 of the wall height.
   c. Ceiling Joist Framing: Vertical deflection of 1/240 of the span.

3. Design framing systems to provide for movement of framing members 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.

B. Design exterior non-load-bearing curtain-wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.5 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining Work.

   1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

C. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements.

D. Welding Certificates: Copies of certificates for welding procedures and personnel.

E. 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.

F. Product Test Reports: From a qualified testing agency indicating that each of the following complies with requirements, based on comprehensive testing of current products:

1. Expansion anchors.
2. Power-actuated anchors.
3. Mechanical fasteners.
4. Vertical deflection clips.
5. Miscellaneous structural clips and accessories.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Engineering Responsibility: Engage a qualified professional engineer, registered in the state where the project is located, to prepare, design, sign and seal calculations, Shop Drawings, and other structural data.

C. 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 cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

D. Mill certificates signed by steel sheet producer indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and galvanized-coating thickness.

E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

F. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

G. Fire-Test-Response Characteristics: Where metal framing is part of a fire-resistance-rated assembly, provide framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by GA File Numbers in GA-600, "Fire Resistance Design Manual," or by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.

H. AISI Specifications: Comply with AISI's "Specification for the Design of Cold-Formed Steel Structural Members".

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

1. Allied American Studco, Inc.
2. Angeles Metal Systems.
3. California Expanded Metal Products Co.
4. California Metal Systems, Inc.
5. Clark Steel Framing Industries.
6. Consolidated Fabricators Corp.
7. Consolidated Systems, Inc.
8. Dale Industries, Inc.
9. Design Shapes in Steel.
10. Dietrich Industries, Inc.
11. Knorr Steel Framing Systems.
12. MarinoWare; Div. of Ware Industries, Inc.
13. Scafco Corp.
14. Steel Construction Systems.
15. Steel Developers, LLC.
16. Steeler, Inc.
17. Studco of Hawaii, Inc.
18. Super Stud Building Products, Inc.
19. Unimast, Inc.
20. United Metal Products, Inc.
21. Western Metal Lath.

2.2 MATERIALS

A. Steel Sheet: 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, minimum

2.3 NON-LOAD-BEARING CURTAIN-WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: As required by structural performance or as indicated.
2. Flange Width: As required for connections and performance.
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, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches

C. 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 and lateral loads, and as follows:.

1. Minimum Uncoated-Steel Thickness: As required for performance and design.
2. Flange Width: 2 inches.

D. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure.

2.4 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, complying with ASTM C 955, and as follows:

1. Minimum Uncoated-Steel Thickness: As required.
2. Flange Width: As indicated..
3. Section Properties: As indicated.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi.

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. End clips.
5. Foundation clips.
6. Gusset plates.
7. Stud kickers, knee braces, and girts.
8. Joist hangers and end closures.
9. Hole reinforcing plates.
10. Backer plates.

2.6 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 bolts and carbon-steel nuts; and flat, hardened-steel washers.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: Corrosion-resistant-coated, self-drilling, self-threading steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.

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, with fluid consistency and 30-minute working time.

D. Thermal Insulation: ASTM C 665, Type I, unfaced mineral-fiber blankets produced by combining glass or slag fibers with thermosetting resins.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations 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 metal framing members by welding. Wire tying of framing members is not permitted. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
4. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 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 not less than three exposed screw threads.

5. Fasten other materials to cold-formed metal framing by welding, bolting, 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 and as follows:

1. Spacing: 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.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

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. 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. Grout bearing surfaces uniform and level to ensure full contact of bearing flanges or track webs on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to ASTM C 1007, unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. 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 metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to manufacturer's written recommendations and requirements in this Section.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 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 not less than three exposed screw threads.

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 and control joints with cold-formed metal framing. Independently frame both sides of joints.

H. Install 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 standard punched openings.

J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet 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 NON-LOAD-BEARING CURTAIN-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 top and bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated and required for performance.

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 studs and anchor to primary building structure.

E. Install horizontal bridging in curtain-wall studs, spaced in rows indicated on Shop Drawings but not more than 54 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 flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

    a. Install solid blocking as required.

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.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.

B. Field and shop welds will be subject to inspection and testing.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace Work that does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: Wire brush, clean, and paint scarred areas, welds, and rust spots on fabricated and installed prime-painted, cold-formed metal framing. Paint framing surfaces with same type of shop paint used on adjacent surfaces.

C. Protect paper-surfaced gypsum sheathing that will be exposed to weather for more than 30 days by covering exposed exterior surface of sheathing with a securely fastened air-infiltration barrier. Apply covering immediately after sheathing is installed.

D. Protect cutouts, corners, and joints in sheathing by filling with a flexible sealant or by applying tape recommended by sheathing manufacturer at time sheathing is applied.

E. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 00 - METAL FABRICATIONS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for countertops.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Slotted channel framing.
5. Slotted channel framing system trolley.
6. Shelf angles.
7. Metal ladders.

B. Products furnished, but not installed, under this Section:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders, slotted-channel framing, and other products indicated to comply with performance requirements, including comprehensive engineering analysis by a qualified professional engineer, licensed in project jurisdiction, using performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Slotted channel framing.
2. Slotted channel framing trolley system.
3. Paint products.
4. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1. Steel framing and supports for countertops.
2. Steel tube reinforcement for low partitions.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Shelf angles.
6. Loose steel lintels.
7. Slotted channel framing trolley system.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer registered in state which project is located responsible for their preparation.

D. Qualification Data: For qualified professional engineer.

E. Welding certificates.

F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design steel framing and supports, slotted channel framing, slotted channel framing trolley system, and other products indicated to comply with performance requirements.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

D. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: As required for structural and equipment load requirements.
2. Galvanized Steel: ASTM A653/A653M, commercial steel, Type B, with G90 coating; 0.079-inch nominal thickness unless otherwise indicated or required to meet structural requirements.
3. Cold-Rolled Steel: ASTM A1008/A1008M, commercial steel, Type B; 0.0966-inch minimum thickness; hot-dip galvanized after fabrication.

F. Slotted Channel Framing Trolley System:

1. Basis of design: Unistrut Trolley System, “Unistrut P2950 4 Wheel Trolley (1/4” Flat Plate Style)” with “P1001 Channel” and “P1386 Clamp.”
2. Galvanized Steel: ASTM A653/A653M, commercial steel, Type B, with G90 coating; 0.079-inch nominal thickness unless otherwise indicated or required to meet structural requirements.

3. Cold-Rolled Steel: ASTM A1008/A1008M, commercial steel, Type B; 0.0966-inch minimum thickness; hot-dip galvanized after fabrication.
4. Fasteners, fittings, and accessories as required for complete installation.
5. Component Sizes: As required for structural and equipment load requirements.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening nickel silver.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

D. Eyebolts: ASTM A 489.

E. Machine Screws: ASME B18.6.3.

F. Lag Screws: ASME B18.2.1.

G. Wood Screws: Flat head, ASME B18.6.1.

H. Plain Washers: Round, ASME B18.22.1.

I. Lock Washers: Helical, spring type, ASME B18.21.1.

J. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

K. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

L. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where exposed to elements and where indicated.

E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. Galvanize shelf angles located in exterior walls.

C. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General:

1. Comply with ANSI A14.3 unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.

B. Steel Ladders:

1. Space siderails 16 inches apart unless otherwise indicated.
2. Space siderails of elevator pit ladders 12 inches apart.
3. Siderails: Continuous, 1/2-by-2-1/2-inch steel flat bars, with eased edges.
4. Rungs: 3/4-inch-diameter steel bars.
5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
6. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
7. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.
8. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
9. Galvanize exterior ladders, including brackets and fasteners.
10. Prime exterior ladders, including brackets and fasteners, with zinc-rich primer.

2.9 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.10 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

D. Install slotted channel framing and slotted channel framing trolley systems in accordance with manufacturer’s written instructions and structural requirements.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

D. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

END OF SECTION 05 50 00

SECTION 05 51 13 - METAL PAN STAIRS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Preassembled steel stairs with concrete-filled treads.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs, including comprehensive engineering analysis by a qualified professional engineer registered in state which project is located, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Uniform Load: 100 lbf/sq. ft..
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/240 or 1/4 inch, whichever is less.

C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
b. Infill load and other loads need not be assumed to act concurrently.

D. Seismic Performance: Metal stairs shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor is 1.5.

1.4 SUBMITTALS

A. Product Data: For metal stairs and the following:

1. Prefilled metal-pan stair treads.
2. Nonslip aggregates and nonslip-aggregate finishes.
3. Abrasive nosings.
4. Paint products.
5. Grout.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer registered in state which project is located responsible for their preparation.

D. Qualification Data: For qualified professional engineer.

E. Welding certificates.

F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs and railings.

1. Test railings according ASTM E 894 and ASTM E 935.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

1. Preassembled Stairs: Commercial class.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs. 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.

C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.

D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

E. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface.

F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

G. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 coating, either commercial steel, Type B, or structural steel, Grade 33, unless another grade is required by design loads.

2.3 ABRASIVE NOSINGS

A. Cast-Metal Units: Cast aluminum, with an integral abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Configuration: Cross-hatched units, 4 inches wide without lip.
2. Configuration: Cross-hatched angle-shaped units, same depth as bar-grating treads and 1 to 1-1/2 inches wide.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.

D. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

2.4 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for exterior stairs.

D. Machine Screws: ASME B18.6.3.

E. Lag Screws: ASME B18.2.1.

F. Plain Washers: Round, ASME B18.22.1.

G. Lock Washers: Helical, spring type, ASME B18.21.1.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.

G. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

2.6 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts,[railings,] clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.
3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.7 STEEL-FRAMED STAIRS

A. Stair Framing:

1. Fabricate stringers of steel plates or channels.

a. Provide closures for exposed ends of channel stringers.

2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements.
3. Weld stringers to headers; weld framing members to stringers and headers.
4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.
5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

B. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch.

1. Steel Sheet: Uncoated hot-rolled steel sheet unless otherwise indicated.
2. Exterior Steel Sheet: Galvanized-steel sheet, where indicated.
3. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
4. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
5. Attach abrasive nosings to risers.

6. At Contractor's option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.
7. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.8 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

C. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

1. Exterior Stairs: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interior Stairs: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

E. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

G. Place and finish concrete fill for treads and platforms to comply with Division 03 Section "Cast-in-Place Concrete."

1. Install abrasive nosings with anchors fully embedded in concrete. Center nosings on tread width.

H. Install precast concrete treads with adhesive supplied by manufacturer.

3.2 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 51 13

SECTION 05 51 19 - METAL GRATING STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal grating stairs.
2. Steel railings and guards.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs, railings, and guards.

1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, blocking for attachment of wall-mounted handrails, and items with integral anchors, that are to be embedded in concrete or masonry.
2. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

D. Schedule installation of railings and guards so wall attachments are made only to completed walls.

1. Do not support railings and guards temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For metal grating stairs and the following:

1. Gratings.
2. Shop primer products.
3. Grout.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.

3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

C. Delegated Design Submittal: For stairs, railings, and guards, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.

1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.

    a. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design stairs, railings, and guards, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft.
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360.

C. Structural Performance of Railings and Guards: Railings and guards, including attachment to building construction, withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
b. Infill load and other loads need not be assumed to act concurrently.

3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. Seismic Performance of Stairs: Metal stairs withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 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. FS Industries.
2. Lapeyre Stair.
3. Panel Built Incorporated.

2.3 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

D. Steel Bars for Grating Treads: ASTM A36/A36M or steel strip, ASTM A1011/A1011M or ASTM A1018/A1018M.

E. Steel Wire Rod for Grating Crossbars: ASTM A510/A510M.

F. Steel Tubing for Railings and Guards: ASTM A500/A500M (cold formed) or ASTM A513/A513M.

G. Steel Pipe for Railings and Guards: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

H. Provide galvanized finish for exterior installations and where indicated.

I. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.4 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls.

1. Select fasteners for type, grade, and class required.

B. Fasteners for Anchoring Railings and Guards to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated and capable of withstanding design loads.

C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be galvanized.

E. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for [**interior**] [**exterior**] use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, railings, guards, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs, railings, and guards in shop to greatest extent possible.

1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish # 3 - Partially dressed weld with spatter removed.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.

1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
2. Locate joints where least conspicuous.
3. Fabricate joints that are exposed to weather in a manner to exclude water.
4. Provide weep holes where water may accumulate internally.

2.7 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Industrial Class, unless more stringent requirements are indicated.

B. Stair Framing:

1. Fabricate stringers of steel plates or channels.

a. Stringer Size: As required to comply with "Performance Requirements" Article.
b. Provide closures for exposed ends of channel stringers.
c. Finish: Galvanized.

2. Construct platforms and tread supports of steel plate or channel headers and miscellaneous framing members as required to comply with "Performance Requirements" Article.

a. Provide closures for exposed ends of channel framing.
b. Finish: Galvanized.

3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers.
4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.

a. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manual."

1. Fabricate treads and platforms from welded steel or pressure-locked steel grating with openings in gratings no more than 5/16 inch in least dimension.

a. Surface: Serrated.
b. Finish: Galvanized.

D. Risers: Solid.

E. Toe Plates: Provide toe plates around openings and at edge of open-sided floors and platforms, and at open ends and open back edges of treads.

1. Material and Finish: Steel plate to match finish of other steel items.
2. Fabricate to dimensions and details indicated.

2.8 FABRICATION OF STAIR RAILINGS AND GUARDS

A. Fabricate railings and guards to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: 1-5/8-inch-diameter top and bottom rails and posts.
2. Intermediate Rails Infill: 1-5/8-inch-diameter intermediate rails spaced less than 21 inches clear.

B. Welded Connections: Fabricate railings and guards with welded connections.

1. Fabricate connections that are exposed to weather in a manner that excludes water.

a. Provide weep holes where water may accumulate internally.

2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
3. Weld all around at connections, including at fittings.
4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
5. Obtain fusion without undercut or overlap.
6. Remove flux immediately.
7. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #3 - Partially dressed weld with spatter removed as shown in NAAMM AMP 521.

C. Form changes in direction of railings and guards as follows:

1. As detailed.
2. By bending or by inserting prefabricated elbow fittings.

D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required.

1. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

E. Close exposed ends of railing and guard members with prefabricated end fittings.

F. Connect posts to stair framing by direct welding unless otherwise indicated.

G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.

1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
2. For galvanized railings and guards, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
3. For nongalvanized railings and guards, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
4. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.9 FINISHES

A. Finish metal stairs after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
3. Comply with requirements for welding in "Fabrication, General" Article.

3.3 INSTALLATION OF RAILINGS AND GUARDS

A. Adjust railing and guard systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.

1. Space posts at spacing indicated or, if not indicated, as required by design loads.
2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet.
3. Align rails and guards so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet.

3.4 REPAIR

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 51 19

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Steel pipe and tube railings.

1.3 PERFORMANCE REQUIREMENTS

A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Steel: 72 percent of minimum yield strength.

B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

3. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..

C. Thermal Movements: Provide exterior railings 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.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings 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 railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for railings. 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.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 STEEL AND IRON

A. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).

B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Castings: Either gray or malleable iron, unless otherwise indicated.

1. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

2.3 FASTENERS

A. General: Provide the following:

1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

D. Anchors: Provide cast-in-place, chemical, or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in 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.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 09 Section “Painting”.

C. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.5 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with either welded or nonwelded connections, unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

J. Form changes in direction as follows:

1. As detailed.

K. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of railing members with prefabricated end fittings.

M. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.

1. At brackets and fittings fastened to gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

P. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

Q. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

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. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize steel and iron railings, including hardware, after fabrication.
2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.

B. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

D. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.

F. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:

1. Exterior Railings (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interior Railings (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, attached to post with set screws.

D. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch buildup, sloped away from post.

E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ANCHORING RAILING ENDS

A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. Use type of bracket with predrilled hole for exposed bolt anchorage.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed gypsum board plaster partitions, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

3.7 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 52 13

SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Wood blocking nailers and furring strips.
2. Plywood backing panels for electrical or communications panels and equipment.

B. Related Sections include the following:

1. Division 06 Section "Sheathing."

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NHLA: National Hardwood Lumber Association.
3. NLGA: National Lumber Grades Authority.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

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.

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 U1; Use categories as follows:

1. UC1: Interior construction not in contact with ground or subject to moisture. Including the following items:

   a. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   b. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
   c. Wood floor plates that are installed over concrete slabs-on-grade.

2. UC3A (Commodity Specification A): Coated sawn products in exterior construction not in contact with ground but exposed to all weather cycles including intermittent wetting. Including the following items:

   a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

3. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

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 the following miscellaneous rough carpentry:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.3 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 15 percent maximum moisture content and any of the following species:

1. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. For exposed boards, provide lumber with 15 percent maximum moisture content.

1. Mixed southern pine, No. 1 grade; SPIB.

D. For concealed boards, provide lumber with 19 percent maximum moisture for lumber not to receive wood preservative treatment

1. Mixed southern pine, No. 2 grade; SPIB.

E. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.5 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 of Type 304 stainless steel or hot-dip zinc coating per ASTM A 153.

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 (ASME B18.2.3.8M).

G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.6 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than 0.025 inch (0.6 mm).

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. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

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 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.

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

SECTION 06 16 00 - SHEATHING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Exterior wall sheathing.

A. Related Requirements:

1. **Section 072726 "Fluid-Applied Membrane Air Barrier" for water-resistive barrier applied over wall sheathing and for exterior gypsum sheathing joint sealant and tape compatible with Fluid-Applied Membrane Air Barrer.**

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies 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 plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. For air-barrier and water-resistant glass-mat gypsum sheathing, include manufacturer's technical data and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.

1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.
2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

A. Composite Mockup Panel: Refer to drawing A-AS1.1 for configuration of Composite Mockup Panel and for materials and construction to be provided that are specified under this Sheathing specification section.

1. Locate Composite Mockup Panel where indicated by Architect and facing a southerly direction.
2. Provide all the construction components that fall under this Sheathing specification that are indicated in the Composite Mockup Panel.
3. Inclusion of Sheathing in Composite Mockup if for providing full exterior wall assemblies associated with exterior material finishes and for general compliance with Sheathing specification, craftmanship and quality.

    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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS, GENERAL

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

B. Factory mark panels to indicate compliance with applicable standard.

2.3 WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Product: Subject to compliance with requirements, provide "Dens-Glass Gold" by G-P Gypsum Corporation or comparable by one of the following:

   a. National Gypsum Company.
   b. USG Corporation.

2. Type and Thickness: Type X, fire rated 5/8 inch thick, where indicated at fire rated assemblies at steel beam and column wraps.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M and Type 304 stainless steel.

B. Power-Driven Fasteners: NES NER-272.

C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

D. Engineered Fasteners for Gypsum Sheathing to Cold-Formed Metal Framing through 2-inch thick rigid insulation - Exterior Wall System W-ST8-STO:

1. Gypsum sheathing to be anchored through rigid insulation to steel studs with engineered fasteners engineered to support the weight of the sheathing and the stucco with the fastener spanning through the 2-inch thickness of the rigid insulation unsupported.

2.5 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.030 inch.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
b. GCP Applied Technologies; Vycor Plus Self-Adhered Flashing.
c. Henry Company; Air-Bloc LF.
d. Polyguard Products, Inc.; Polyguard 300.

B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.

2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.

C. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

D. Seal sheathing joints according to sheathing manufacturer's written instructions and as is consistent with and in accordance with specification section 072726 Fluid Applied Membrane Air Barriers.

END OF SECTION 06 16 00

SECTION 06 41 16 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
5. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Verification: For the following:

1. Plastic Laminates: 12 by 12 inches, for each type, color, pattern, and surface finish required.
    a. Provide one sample applied to core material with specified edge material applied to one edge.
2. Corner Pieces:
    a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
    b. Miter joints for standing trim.
3. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of product, signed by fabricator.

C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.7 QUALITY ASSURANCE

A. Fabricator's Qualifications: 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.
    1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
    1. Build mockups of typical architectural cabinets as shown on Drawings.
    2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.9 FIELD CONDITIONS

A. Environmental Limitations with Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where cabinets are 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 cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

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. Certified Wood: Interior architectural woodwork shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

C. Wood Products: Comply with the following:

1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
2. Low-Emitting Materials: Composite wood products shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
3. Hardboard: AHA A135.4.

4. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
5. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
6. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

1. Products: Subject to compliance with requirements, provide products indicated in the Finish Schedule on the Drawings or comparable products by one of the following:

a. ABET Inc.
b. Formica Corporation.
c. Laminart LLC.
d. Wilsonart LLC.

2.2 ARCHITECTURAL CABINET MANUFACTURERS

A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural cabinets.

2.3 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.

2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Architectural Woodwork Standards Grade: Custom.

C. Type of Construction: Frameless.

D. Door and Drawer-Front Style: Flush overlay.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

F. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade HGS.
2. Postformed Surfaces: Grade HGP.

3. Vertical Surfaces: Grade HGS.
4. Edges: Grade HGS.

G. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.

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, NEMA LD 3, Grade VGS.

2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

H. Backpriming: Apply two coats of sealer or primer, compatible with finish, to concealed surfaces of cabinets.

I. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

J. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

K. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

L. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces as indicated on Finish Schedule.

2.4 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.

2.5 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 135 degrees of opening, self-closing.

C. Back-Mounted Pulls: ANSI/BHMA A156.9, B02011.

1. Style: As indicated on the drawings.

D. Catches: Magnetic catches, ANSI/BHMA A156.9, B03141.

E. Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04071; with shelf rests, B04081.

F. Shelf Rests: ANSI/BHMA A156.9, B04013; metal.

G. Drawer Slides: ANSI/BHMA A156.9.

H. Door Locks: ANSI/BHMA A156.11, E07121.

I. Drawer Locks: ANSI/BHMA A156.11, E07041.

J. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.

K. Tempered Float Glass for Cabinet Doors: ASTM C1048, Kind FT, Condition A, Type I, Class 1 (clear), Quality-Q3, 6 mm thick unless otherwise indicated.

L. Grommets for Cable Passage: 2-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

M. Grommets for Trash Hole in Countertops: 7-inch inside diameter, 2 inch deep, 0.048 inches thick stainless steel. Color and finish as selected by Architect.

N. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.

1. Satin Chromium Plated: ANSI/BHMA 626 for brass or bronze base; ANSI/BHMA 652 for steel base.

O. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.6 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 metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesives: Do not use adhesives that contain urea formaldehyde.

D. Adhesive for Bonding Plastic Laminate: Contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.7 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

B. 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 architectural cabinet fabrication will be complete.
2. Trial fit assemblies at manufacturer's 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 before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, 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.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings 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.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 FIELD QUALITY CONTROL

A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.

1. Inspection entity shall prepare and submit report of inspection.

3.4 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 06 41 16

SECTION 06 83 16 – FIBERGLASS-REINFORCED PANELING (FRP)

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic (FRP) sheet paneling.
2. Supplementary components and accessories normally furnished or otherwise necessary for a complete installation.

1.3 REFERENCES

A. Acronyms and Abbreviations:

1. FRP: Fiberglass-Reinforced Plastic.
2. USDA: United States Department of Agriculture.

B. Definitions:

1. Manufacturer: Means the FRP manufacturer unless otherwise indicated.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data: For each type of product.
2. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

B. Closeout Submittals:

1. Maintenance Data: For FRP to include in maintenance manuals.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install FRP until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain FRP and trim accessories from the same manufacturer.

2.2 FIBERGLASS-REINFORCED PANELING (FRP)

A. FRP: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319. Panels shall be USDA-accepted for incidental food contact.

1. Manufacturer: Marlite, Inc.
2. Product: “Standard FRP”.
3. Nominal Thickness: Not less than 0.09 inch.
4. Surface Finish: As selected by the Architect.
5. Color(s): As selected by the Architect from the manufacturers full range of standard colors.

2.3 ACCESSORIES

A. Trim Accessories: Manufacturer's standard vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

1. Color: Match panels.

B. Adhesive: As supplied, recommended, or required by the manufacturer.

C. Sealant: Sealant recommended in writing by the manufacturer and complying with requirements in Section 07 92 00 Joint Sealants.

D. Other Accessories: Provide other accessories supplied, recommended, or required by the manufacturer as necessary for a complete installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Installation of FRP indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Remove materials that might interfere with adhesive bond.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints so that trimmed panels at corners are not less than 12 inches wide.

1. Mark plumb lines on substrate at panel joint locations for accurate installation.

3.3 INSTALLATION

A. Install FRP according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install trim accessories with adhesive.

1. High-Moisture and Wet Areas: Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.

D. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

E. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 06 83 16

SECTION 07 01 50.19 - PREPARATION FOR REROOFING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. The Work of This Section Includes:

1. Full roof tear-off.
2. Base flashing removal.
3. Disposal.

B. Related Requirements:

1.3 DEFINITIONS

A. Full Roof Tear-off: Removal of existing roofing system down to existing concrete roof deck.

1.4 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing tear-off, including, but not limited to, the following:

a. Reroofing preparation, including roofing system manufacturer's written instructions.
b. Temporary protection requirements for existing roofing system components that are to remain.
c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.

e. Existing roof deck conditions requiring Architect notification.
f. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
g. Structural loading limitations of roof deck during reroofing.
h. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
i. Asbestos removal and discovery of asbestos-containing materials.
j. Governing regulations and requirements for insurance and certificates if applicable.
k. Existing conditions that may require Architect notification before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Photographs or Video: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations.

1. Submit before Work begins.

B. Landfill Records: Indicate receipt and acceptance of demolished roofing materials and hazardous wastes, such as asbestos-containing materials, by a landfill facility licensed to accept them.

1.6 FIELD CONDITIONS

A. Existing Roofing System:

1. Vapor Barrier: SBS- modified bitumen vapor barrier, torch applied.
2. Base ply: SBS-modified bitumen
3. Cap Sheet: SBS-modified bitumen cap ply with ceramic coated granules.
4. Insulation: 2-inches of polyisocyanurate.
5. Tapered: 1/4-inch per 12” polyisocyanurate.
6. Cover Board: 1/2-inch Georgia Pacific Dens Deck Prime
7. Membrane, Flashing and Insulation Adhesive and Concrete Primer.
8. Walk Pads: SBS-modified bitumen ply walkpaths.

B. Protect building to be reroofed, existing site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations

C. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
1. Construction Drawings of reroofing work from 20111 are available from Owner upon request for existing roofing system for Contractor's convenience and information, but they are not a warranty of existing conditions. They are intended to supplement rather than serve in lieu of Contractor's own investigations. Contractor is responsible for conclusions derived from existing documents.

D. Limit construction loads on existing roof areas to remain, and existing roof areas scheduled to be reroofed.

1. Request load limits from structural engineer for rooftop equipment wheel loads and for uniformly distributed loads.

E. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

1. Remove only as much roofing in one day as can be made watertight in the same day.

F. Hazardous Materials:

1. It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.

2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner for testing.

3. A report on the presence of hazardous materials in the building is included in Section 028233 and on the H1-series drawings as produced by S&ME and as referenced in section 001070 Special Conditions. Examine report to become aware of locations where hazardous materials may be present adjacent to roofing removal.

a. Do not disturb hazardous materials or items suspected of containing hazardous materials except according to procedures specified elsewhere in the Contract Documents.
b. Coordinate reroofing preparation with hazardous material remediation to prevent water from entering existing roofing system or building.

PART 2 - EXECUTION

2.1 PREPARATION

A. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

2.2 ROOF TEAR-OFF

A. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.

B. Full Roof Tear-off: Remove existing roofing and other roofing system components down to the existing concrete roof deck.

1. Remove vapor retarder roof insulation and cover board.

2. Remove base flashings and counter flashings.
3. Remove perimeter edge flashing and gravel stops.
4. Remove copings.
5. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
6. Remove roof drains indicated on Drawings to be removed.
7. Remove wood blocking, curbs, and nailers.

2.3 DECK PREPARATION

A. Inspect concrete deck after tear-off of roofing system.

1. Bring to the Owner’s and Architect’s attention any concerns with any portion of the existing concrete deck relative to being suitable for the newly specified roofing before proceeding with new roofing work.

2.4 TEMPORARY ROOFING

A. Install approved temporary roofing over area to be reroofed.

B. Install temporary roofing over area to be reroofed.

C. Remove temporary roofing before installing new roofing.

2.5 BASE FLASHING REMOVAL

A. Remove existing base flashings and counter flashing.

1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.
2. Remove all existing wood blocking, cubs and nailers.

2.6 DISPOSAL

A. Collect demolished materials and place in containers.

1. Promptly dispose of demolished materials.
2. Do not allow demolished materials to accumulate on-site.
3. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 07 01 50.19

SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

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. Modified bituminous sheet waterproofing over vertical walls and over mud slab under elevator concrete slab.

B. Related Sections include the following:

1. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.

1.3 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.

C. Qualification Data: For Installer.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.

E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is acceptable to waterproofing manufacturer for installation of waterproofing required for this Project.

B. Source Limitations: Obtain waterproofing materials through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1/16 inch (1.6 mm) in width.
2. Warranty Period: Five years from date of Substantial Completion.

B. Special Installer's Warranty: Signed by Installer, covering Work of this Section, for warranty period of two years.

1. Warranty includes removing and reinstalling protection board.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Not less than 60-mil- (1.5-mm-) thick, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated to a 4-mil- (0.10-mm-) thick, polyethylene film with release liner on adhesive side.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. American Hydrotech, Inc.; VM 75.
b. American Permaquik Inc.; PQ 7100.
c. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
d. CETCO Building Materials Group; Envirosheet.
e. Grace, W. R. & Co.; Bituthene 4000.
f. Henry Company; Blueskin WP 200.
g. Meadows, W. R., Inc.; SealTight Mel-Rol.
h. Nervastral, Inc.; BITU-MEM.
i. Pecora Corporation; Duramem 700-SM.
j. Polyguard Products; Polyguard 650.
k. Progress Unlimited, Inc.; Plastiwrap 60.
l. Tamko Roofing Products, Inc.; TW-60.

2. Physical Properties:

a. Tensile Strength: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970.
d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
f. Hydrostatic-Head Resistance: 150 feet (45 m) minimum; ASTM D 5385.
g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
h. Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m); ASTM E 96, Water Method.

2.2 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid primer recommended for substrate by manufacturer of sheet waterproofing material.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.

F. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.

G. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

1. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches (114 mm) wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
2. Detail Strips: 62.5-mil- (1.58-mm-) thick, felt-reinforced self-adhesive strip, 9 inches (229 mm) wide, with release film on adhesive side.

H. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (229-mm) centers.

I. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: 1/4 inch (6 mm), nominal.
2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for type of protection course.

2.3 BONDED HDPE OR POLYETHYLENE SHEET WATERPROOFING

A. Bonded HDPE or Polyethylene Sheet for Horizontal Applications Over Mud Slab: Uniform, flexible, multilayered-composite sheet membrane consisting of either an HDPE film coated with pressure-sensitive adhesive and protective release liner, total 46-mil (1.2-mm) thickness, or a cross-laminated film of low- and medium-density polyethylene, coated with a modified asphalt layer and a nonwoven geotextile-fabric final layer, total 95-mil (2.4-mm) thickness; with the following physical properties:

1. Tensile Strength, Film: 2000 psi (13.8 MPa) minimum; ASTM D 412.
2. Low-Temperature Flexibility: Pass at minus 10 deg F (minus 23 deg C); ASTM D 1970.
3. Peel Adhesion to Concrete: 5 lbf/in. (875 N/m) minimum; ASTM D 903, modified.
4. Lap Adhesion: 2.5 lbf/in. (440 N/m) minimum; ASTM D 1876, modified.
5. Hydrostatic-Head Resistance: 231 feet (70 m); ASTM D 5385, modified.
6. Puncture Resistance: 200 lbf (890 N) minimum; ASTM E 154.

7. Water Vapor Permeance: 0.01 perms (0.6 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
8. Water Absorption: 0.5 percent maximum; ASTM D 570.

B. Mastic, Adhesives, and Detail Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
2. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Verify that compacted subgrade is dry, smooth, and sound; and ready to receive adhesive-coated HDPE sheet.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch (1.6 mm).

F. Bridge and cover discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.
b. At plaza deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths to provide a minimum of 2 thicknesses of sheet membrane over areas to receive waterproofing.

E. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

F. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.

G. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.

I. Install protection course with butted joints over waterproofing membrane immediately.

J. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

3.4 FIELD QUALITY CONTROL

A. Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions; surface preparation; membrane application, flashings, protection, and drainage components.

3.5 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.6 BONDED HDPE OR POLYETHYLENE SHEET-WATERPROOFING APPLICATION

A. Install bonded HDPE or polyethylene sheets according to manufacturer's written instructions.

B. Horizontal Applications: Install sheet with HDPE or polyethylene face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation.

C. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.

D. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.

E. Install sheet-waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.

F. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches (150 mm) beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.

END OF SECTION 071326

SECTION 07 18 00 – PEDESTRIAN TRAFFIC COATINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES: Traffic coatings for the following applications:

A. New pedestrian traffic-bearing waterproofing system for elevated pedestrian walkways or roof-top areas as indicated on drawings.

B. Control and expansion joints on exposed surfaces.

C. Perimeter joints between wall surfaces and frames of doors, windows, louvers and other openings.

D. Joints as indicated or as necessary.

E. Accessories necessary for a complete installation

1.2 REFERENCES

A. ASTM C 920 - Standard Specification for Elastomeric joint sealants.

B. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's standard submittal package including specification, installation instructions, and general information for each product indicated. For coatings, indicate VOC content in g/L.

B. Shop Drawings: Show extent of each traffic coating. Include details for treating substrate joints, cracks, flashings, deck penetrations, and other termination conditions.

C. Samples for Initial Selection: For each type of finish/system indicated.

D. Sample Warranty: For Manufacturer's Warranty.

1.4 QUALITY ASSURANCE

A. Primary polyurethane elastomeric coating system requirements:

1. Single manufacturer. Manufacturer shall have a minimum of ten (10) years experience in the manufacture of materials of this type.
2. Applicators shall have a minimum of five (5) years of experience in the application of waterproofing materials of the type specified. Applicator shall possess a current

"Qualified Applicator" certificate from the specified waterproofing manufacturer. Applicator shall have an active license with the SC LLR with classification minimum of BD-4

B. Materials other than specified shall be submitted to the architect/owner for approval no later than ten (10) days prior to bid date. In requesting prior approval, it shall be necessary to submit:

1. A letter of certification stating that the alternative material is equal to or better than the specified product.
2. Independent laboratory test data giving physical property values in comparison to the specified material.

C. The static coefficient shall exceed the minimum recommendations of the American Disability Act (ADA), for accessible routes, for wet and dry surfaces, and for leather and rubber heel materials.

D. Pedestrian Traffic Coating Materials: Obtain traffic coating materials from a single manufacturer for each different product required for the traffic coating system.

E. Vapor Drive Testing: Where vapor drive may be a concern, perform testing to determine vapor drive utilizing a calcium chloride vapor emission test kit (https://www.humboldtmfg.com/vapor-emission-test-kit.html) per ASTM F1869. Record results and contact your local manufacturer representative to determine whether a vapor tolerant primer will be necessary.

F. Manufacturers approved technical representative shall be onsite to inspect installing contractors progress, during the contractors working hours, a minimum of (2) times per week from project start thru project completion. Upon each inspection, manufacturer shall supply a progress report with photos to the Architect of Record, Owner/Owners Representative, Installing Contractor and any others as directed by the Architect of Record.

1.5 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference approximately two weeks before scheduled commencement of sealant installation and associated work.

B. Require attendance of installers of traffic coating products and other associated work which must precede or follow traffic coating work as well as, Architect, Owner, and traffic coating manufacturer's representative.

C. Objectives include:

1. Review foreseeable methods and procedures related to traffic coating work, including set up and mobilization areas for stored material, and phasing.
2. Review safety concerns related to the work including traffic control methods.
3. Tour representative areas of concrete substrates, inspect and discuss condition of substrate and preparatory work.
4. Review Drawings, Specifications and other Contract Documents.
5. Review and finalize schedule related to sealant work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid

delays.

6. Review required inspection, testing, certifying procedures.
7. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary weather protection.
8. Record conference including decisions and agreements reached. Furnish a copy of records to each party attending.

D. Mock-Ups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged and should be applied as follows:

1. After surface prep and/or coating removal, one representative area will be identified for the traffic coating mock-up. Apply deck coating to at least 200 sq. ft. to demonstrate surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.
2. Remove and re-apply mock-ups until they are approved by product rep.
3. Approved mock-up may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store all coating materials in clean, dry location protected from exposure to direct sunlight. Store materials in the original unopened containers at 50° to 80°F (10° to 27°C) until ready for use.

C. Store and handle materials in compliance with manufacturer's recommendations to prevent deterioration or damage due to moisture, high/low temperatures, contaminants, or other causes.

D. Safety: Refer to all applicable data, including, but not limited to safety data sheets, technical data sheets, product labels and specific instructions for specific personal protection requirements.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Proceed with work of this section only when existing and forecasted weather conditions will permit the application to be performed in accordance with the manufacturer's recommendations.

B. New concrete must be cured for at least 30 days prior to applying flooring system.

C. Maintain surface and ambient temperature according to manufacturer’s recommendations. Surface temperature must be at least 5°F above dew point.

D. Concrete must be free of hydrostatic, capillary, or moisture pressure. Substrates in contact with the ground must have a properly installed, functioning, and effective moisture vapor barrier to help prevent potential problems resulting from hydrostatic, capillary or moisture vapor pressure. Concrete must contain less than 3.0 pounds per 1,000 square feet per 24 hours when tested per ASTM F-1869.

E. Concrete should have been designed and installed as approved by architect/engineer to minimize random cracking, curling, and slab deflections and shall contain well-designed control and isolation joints as approved by architect/engineer.

F. Do not apply sealers or membrane curing agents to concrete. Moisture curing is recommended. If said agents have been placed, they are to be removed prior to application of any part of this system.

G. Surfaces are to be kept free of traffic and no trades shall be permitted in areas during the preparation of the concrete surface, the application of the coating system, or the curing cycle of the coating system.

1.8 WARRANTY

A. Installer Warranty: The contractor shall guarantee that all work performed will be free from defects in materials and workmanship for a period of three (3) years from the date of Substantial Completion. Upon notice of defect in writing to the contractor within three years after completion of work, the contractor shall, at his own expense, make necessary repairs or replacements of the defective work in question.

B. Manufacturer’s Warranty: Manufacturer's standard form in which traffic coating manufacturer agrees to furnish traffic coating products 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:

a. Pedestrian Traffic Coating System (Heavy Duty): Ten (10) Year Material Warranty

C. Pedestrian Traffic Coating Systems are available for commercial projects only. Contractor must be eligible for installing, and make application to , prior to the start of work under this section.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer and Product

1. The Garland Company, Inc; Dura-Walk Pedestrian Roof Deck System

2. Manufacturer’s Representative:

a. Scott Shelton, sshelton@garlandind.com, 803-622-8990 m

B. Acceptable Alternate Manufacturers subject to compliance with specified requirements herein:

1. Lymtal International
2. Neogard

C. Compatibility: Provide traffic coating, hybrid joint sealant, and other related materials that are compatible with one another and with substrates under conditions of service and application, as demonstrated by traffic coating manufacturer based on testing and field experience.

D. Colors: Provide color of exposed traffic coating to comply with the following:

1. Provide selections for review and approval by Owner from manufacturer's full range of standard colors for products of type indicated.

E. Basis of Design materials and performances as specified herein shall be regarded as the minimum standard of quality required for work in this section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.

2.2 JOINT SEALANTS

A. Sealant Standard: Provide manufacturer's recommended sealants that comply with ASTM C 920 and other requirements indicated on each joint sealant data sheet at the end of this section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.

1. Hybrid Joint Sealant

a. One part, 100% solids, non-sag sealant as approved and furnished by the system manufacturer for cracks, movement and non-movement joints.

1) Service Temp -40°F to 200°F (-40°C to 93°C)
2) Elongation, ASTM D 412: 550%
3) Hardness, Shore A, ASTM C 661: 24 +/-3

2. Epoxy Urethane Hybrid Sealant

a. Two part, 100% solids, self-leveling high performance, durable sealant as recommended and furnished by the system manufacturer for heavily pitted areas of concrete, leveling course and deep cracks.

1) Tensile Strength, ASTM D 412: 3,289 psi
2) Flexural Strength, ASTM D 790: 2,782 psi
3) Elongation, ASTM D 412: 50.4%

2.3 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are non-staining; 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. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Proprietary, reticulated, closed-cell polymeric foam, non-out-gassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 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 in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

2.5 PEDESTRIAN TRAFFIC COATING

A. Primer: two (2)-component high solids Zero VOC epoxy concrete sealer/primer.

B. Polyurethane Base Coating: one-component polyurethane coating.

C. Polyurethane Intermediate Coating: Top Coat, one-component polyurethane coating.

D. Polyurethane Top Coating: one-component polyurethane coating.
Note: Top Coating shall be available in a minimum of three (3) different colors.

E. Aggregate:

1. Uniformly graded, hard non-crushable, non-angular, rounded, washed silica sand (16/30 mesh), unless otherwise specified.
2. Spreading Rate: As recommended by manufacturer for the specified system, substrate, type of aggregate, location, and service conditions indicated.

F. Joint and Crack Sealant: hybrid, single-component joint sealant.

G. Component Coat Thickness: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following (measured excluding aggregate):

1. Primer: Apply specified primer at 300 sq. ft. / gal; approx. 5 wet film thickness (WFT)
2. Base Coat: 50 sq. ft. / gal; 32 mils WFT
3. Intermediate Coat: 100 sq. ft. / gal; 16 mils WFT
4. Top Coat: 100 sq. ft. / gal; 16 mils WFT
5. Total System Thickness: 64 mils WFT

PART 3 - EXECUTION

3.1 EXAMINATION

A. Manufacturers rep shall verify that the substrate is ready to receive work; surface is clean, dry, and free of substances that could affect bonding or the performance of the new traffic coating.

B. Verify that the concrete meets the requirements of the coating manufacturer.

C. Begin coating application only after minimum concrete curing and drying period recommended by the designer of record and concrete contractor has passed, after unsatisfactory conditions have been corrected, and after surfaces are dry.

1. Verify that substrates are visibly dry and free of moisture.
   a. Test for vapor transmission by plastic sheet method according to ASTM D4263
2. Installing contractor(s) shall verify that no vapor drive issues will negatively affect the performance of the new traffic coating.
   a. Calcium chloride test will establish vapor drive issues within the slab that may prevent functional performance of new coating applications. Install several test kits around the area to be coated and compare the weight of the calcium chloride before and after the duration of the test. All testing should be documented and filed as a pre-job checklist item. A detailed outline for the test can be found online at https://www.humboldtmfg.com/vapor-emission-test-kit.html

D. Perform adhesion tests per manufacturer's recommendations when going over existing traffic coating membranes or coatings.

E. Installing contractor(s) shall verify that all other work involved with this area, done under other sections, has been completed and accepted by the architect and general contractor prior to starting the waterproofing application.

F. Application of coating shall indicate acceptance of surface and conditions.

3.2 PREPARATION

A. Surface Cleaning: Clean substrate to remove any and all surface contaminants. Concrete surfaces must be thoroughly clean, dry and free from any surface contaminates or cleaning residue. Acceptable methods of cleaning are sandblasting, shotblasting or mechanical grinding followed by the complete removal of any residue. Concrete surface profile required for is CSP-3.

B. Mask off all adjoining areas that are not to receive traffic coating.

C. Provide a suitable workstation to mix the coating materials.

D. The concrete surfaces shall be of sound structural grade (3000 psi compressive strength recommended), of adequate design and thickness, and shall have a steel troweled followed by a fine broom finish, free of fins, ridges, voids or air entrained holes.

E. Concrete: Special attention should be given to smoothness of surface and freedom from contaminants including paint and/or previous coatings. Curing compounds if used shall be removed by shotblasting. In the event specifications are not met, the following corrective procedures are recommended.

1. Surface Contaminants: Wipe up grease or oil with a solvent and absorbent sweeping material. Disposal of this material should be in accordance with local laws and codes. Wash with solvent-alkaline cleaners diluted one part cleaner and five parts water. Rinse thoroughly with clean water.
    a. Remove curing compounds by shotblasting. Grinding may remove heavy deposits of contaminants.
2. Fins and projections: Grind smooth.
3. Rock Pockets and Depressions: Commercially available concrete patching compounds can be used provided they contain no bitumen based binders. Only those patching compounds utilizing a binder are recommended for patching. Neat cement sacking is NOT an acceptable surface preparation for coatings.
4. Small/Shallow Depth Concrete Repairs – Perma-Top Patch Kit: Sound the concrete to outline the size and shape of the spalled and/or de-bonded concrete area. Saw cut the perimeter of the repair area to prevent feathering out of the patch material. Chipped out the deteriorated concrete and around the reinforcing steel. Sandblast or grind the reinforcing steel and patch area to remove rust and surface contaminants that would prevent good adhesion of the repair material. Patch with Perma-Top Repair Kit per the product data sheets. See typical shallow depth concrete repair detail for more information.
5. Deep/Larger Concrete Repairs – Contractor shall contact the manufacturer's representative.
6. Heavily Pitted Areas of Concrete – Leveling Course: Shotblast or grind the pitted areas. Use a notched squeegee to float primer over the pitted areas and broadcast sand aggregate into the epoxy while it is still wet. Allow to cure before installing Pedestrian Traffic Coating system.

3.3 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through the traffic coatings and at expansions joints, drains, and sleeves by installing hybrid sealant per the manufacturer's specifications.

3.4 JOINT AND CRACK TREATMENT

A. Rout all cracks > 1/16" and caulk with hybrid, single-component sealant

B. Remove and replace sealant at all expansion, control, cove, and construction joints with hybrid, single-component sealant.

3.5 WALLS AND EDGE DETAILING

A. Apply a cove joint of hybrid sealant at the deck to wall transition. Apply a detail coat of Primer and 23 mil Base Coat, turning up the wall 4" (refer to manufacturers application guidelines for reference).

B. For slab edges, turn down face of slab edge 4" with Primer, Base Coat and Top Coat

3.6 JOINT PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

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 concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by applicably 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 from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other 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 indicated or where recommended by joint sealant

manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. 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.

3.7 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   a. Do not leave gaps between ends of joint fillers.
   b. Do not stretch, twist, puncture, or tear joint fillers.
   c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
2. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joint where required to prevent third-side adhesion of sealant to back of joint.

D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes, and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

E. Tooling of Non-sag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise noted.
   a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.8 INSTALLATION OF PEDESTRIAN TRAFFIC COATING SYSTEM

A. Pedestrian Traffic Coating System (Heavy Duty)

1. Technical Advice: The installation of this waterproofing membrane shall be accomplished in the presence of, or with the advice of, the manufacturers approved technical representative. Contact the nearest local/regional office for assistance.
2. Detail Work: Apply a 4" wide application of primer followed by a 23 mil detail coat of Base Coat at all cracks, transitions, movement joints, control joints and cove joints.
3. Primer: Prime all surfaces to be coated with primer at the rate of 300 sf/gal, mix only as much as can be used in a 2 hour period and allow to cure.
4. Base Coat: Install 32 mil application of base coat at the rate of 50 sf/gal in low humidity conditions (< 75% R.H.). Apply Base Coat with a notched squeegee and back roll with a heavy-duty nap roller to help avoid pin holes and squeegee lines. Repair any pinholes as they occur. Allow Base Coat to cure overnight for at least 16 hours or until tacky and not wet (*but not more than 72 hours before installing the next intermediate or top coat*).
5. Intermediate Coat: 5. Intermediate Coat: Install 16 mil application of top coat at the rate of 100 sf/ gal in low humidity conditions (< 75% R.H.). Apply Intermediate Coat with a notched squeegee. While coating is still wet, broadcast 1630 rounded sand aggregate uniformly into wet coating with a seed spreader at a rate of 10-20 lbs / 100 sf. Note: A seed spreader tends to work very well in lieu of spreading by hand which typically results in uneven aggregate. Back roll with a heavy-duty nap roller to help avoid pinholes and squeegee lines. Repair any pin holes as they occur. Allow the Intermediate Coat to cure overnight for at least 16 hours or until tacky and not wet (but not more than 72 hours before installing the next intermediate or top coat).
6. Top Coat: Install 16 mil application of top coat in the desired color at the rate of 100 sf/ gal in low humidity conditions (< 75% R.H.). Apply Top Coat with a notched squeegee. While coating is still wet, broadcast 16/30 rounded sand aggregate uniformly into wet coating with a seed spreader at a rate of 10-20 lbs / 100 sf. Note: A seed spreader tends to work very well in lieu of spreading by hand which typically results in uneven aggregate. Back roll with a heavy-duty nap roller to help avoid pinholes and squeegee lines. Repair any pin holes as they occur. Allow Top Coat to cure overnight for at least 16 hours for foot traffic (72 hours for vehicular traffic).

3.9 CLEANING AND PROTECTION

A. Clean off excess sealants or smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

B. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they 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 that and installations with repaired areas are indistinguishable from original work

C. Protect traffic coatings from damage and wear during the remainder of construction period.

D. Clean spillage from adjacent construction using cleaning agents and procedures recommended by the manufacturer of affected construction.

E. Coordinate traffic re-striping and phasing operations with Owner.

END OF SECTION – 07 18 00

SECTION 07 21 00 - THERMAL INSULATION

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Glass-fiber thermal blanket insulation.
2. Glass-fiber sound attenuation blanket insulation.
3. Extruded polystyrene foam-plastic board insulation.
4. Spray applied fiberglass insulation for mechanical room ceilings – Alternate No. 4
5. Vapor Barrier.

A. Related Requirements:

1. Section 042000 "Unit Masonry" for insulation installed in masonry cells.
2. Section 075423 “Thermoplastic-Polyolefin (TPO) Roofing” for roof insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to 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.

1.7 ENVIRONMENTAL CONDITIONS FOR SPRAY APPLIED FIBERGLASS INSULATION

A. Protect insulation materials from physical damage and from deterioration due to 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.

B. Protect insulation materials from physical damage and from deterioration due to 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.

1.8 PROTECTION FOR SPRAY APPLIED FIBERGLASS INSULATION

A. Protect insulation materials from physical damage and from deterioration due to 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.

B. Protect insulation materials from physical damage and from deterioration due to 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Johns Manville.
3. Knauf Insulation.
4. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Insulation Characteristics:

1. Sound Attenuation Insulation: 1 1/2” thick insulation for use with 2 1/2” shaft wall studs.
1. Sound Attenuation Insulation: 3" thick insulation for use with 4” shaft wall studs.

2. Sound Attenuation Insulation: 3 1/2" thick insulation.
3. Therma: Min R-Value of 6 for 1 ½" thick insulation.
4. Thermal: Min R-Value of 11 for 3" thick insulation for use with 4" shaft wall studs.
5. Thermal: Min. R-Value of 13 for 3 1/2" thick insulation.
6. Thermal: Min. R-Value of 19 for 6" thick insulation.

D. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.2 SC Extruded Polystyrene Board Insulation, Type X ASTM C578, Type X, 15-psi (104-kPa) minimum compressive strength with moisture resistance face.

2.3 SPRAY APPLIED FIBERGLASS INSULATION SYSTEM – MECHANICAL ROOM ALTERNATE NO. 4

A. Bases of Design: MONOGLASS Spray-On White Fiber conforming to CAN/ULC S102-10 and ASTM E-136 using MONOGLASS Liquid Bonding Adhesive manufactured by Monoglass Incorporated. Fibers shall consist of Type 902 Bio Soluble fiberglass.

1. Thickness and R-Value: R-4.0 per inch. 5" thick without mechanical support. Total R-value, R-20.

B. Thermal /acoustic insulation shall not contain asbestos, free crystalline silica or combustible fibers, and shall exhibit the following properties indicating; Property, Test Method and Result.

1. Fire Hazard Classification: ASTM E84-07: CAN/ULC S102-10: Flame Spread = 0 Smoke Developed = 0
2. Non-Combustibility: ASTM E-136-11, ISO 1182-90: Non-Combustible
3. Air Erosion: ASTM E859: No Mass Loss
4. Smolder Resistance: CGSB 51-GP-36P: Passed: 0.4% mean weight loss
5. Vibration Resistance: Type 1 CGSB 51GP-11M: Passed: 0.02% mass loss
6. Dry Density: ASTM D-1622-83: 3.0 pounds/cubic foot
7. Thermal Conductivity: ASTM C-518: K-Factor .25, R-Value 4.00/inch
8. Noise Reduction Coefficient: ASTM C-423: NRC = .85, 1.4" on solid backing ISO 354 NRC = .75 @ 25mm/1"* NRC = .95 @ 50mm/2"*
9. Fire Gas Toxicity: University of Pittsburgh Protocol: Max CO2 3.5%, Max CO 0.3%
10. Fungus & Bacterial Resistance: ASTM G-21 MIL STD810F: No Growth.

2.4 VAPOR BARRIER

A. Products: Subject to compliance with requirements, provide the following:

1. Typical underslab vapor barrier:

a. Stego Industries, Stego Wrap, 15 mil.

1) Water Vapor Transmission Rate: ASTM E 96 - 0.006 WVTR or lower.
2) Water Vapor Barrier: ASTM E 1745 - Meets Class A (Plastics)
3) Seam Tape: Stego Tape by Stego Industries.
    a. Seam Tape: ASTM E96 - 0.3. perms or lower.

2. Approved Equals

a. Viper Vapor Check II 15 Mil “Class A” Vapor Barrier
b. Vaporblock VB15 15 Mil “Class A” Vapor Barrier

B. Vapor-Barrier Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

C. Vapor-Barrier Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation 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. 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.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

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 insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

E. Glass-Fiber Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

3.4 INSTALLATION FOR BOARD INSULATION DIRECTLY OVER EXTERIOR STUDS

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 16 inches (610 mm) o.c. both ways on inside face to studs or with plastic washer as temporary anchorage and as recommended by manufacturer.

1. Permanent anchorage of board insulation is with anchorage of gypsum sheathing through insulation board to steel studs.

B. SC Extruded Polystyrene Board insulation is a combustible material and is to be separated from the interior of the building with a continuous layer 5/8-inch gypsum wall board on the interior side of the exterior wall studs.

C. Prolonged exposure to ultraviolet radiation my cause the surface to become faded and dusty. A light-colored, opaque protective covering should be provide over the insulation board if excessive solar exposure is expected.

3.5 INSTALLAION OF SPRAY APPLIED FIBERGLASS INSULATION SYSTEM – MECHANICAL ROOM ALTERNATE NO. 4

A. Examination:

1. Examine all surfaces and conditions to which the work of this section is to be applied. Ensure they are adequate to provide a satisfactory application of the specified materials. Report any deficiencies to the design authority.

B. Preparation:

1. Spray applied fiberglass thermal insulation is to be applied to the underside of and existing cast-in -place concrete slab and beams.
2. Remove any dust, dirt, foreign material, loose paint etc. on surfaces to which the work is to be applied, which could otherwise create a false bond or staining of insulation. Clean and seal as required.
3. Verify bond requirements and compatibility of all surfaces to receive thermal insulation materials.
4. Ensure that all ducts, piping, equipment, or other items, which would interfere with application of thermal insulation, are not positioned until thermal insulation work is completed.

C. Application:

1. Mix and apply thermal insulation in strict accordance with manufacturer's recommendations.
2. Apply insulation to the substrate as specified in the site drawings.
3. Apply insulation to substrate in sufficient thickness to achieve required thermal (acoustic) value.

D. Sealer:

1. Board tamp sprayed insulation surface and apply Monoglass adhesive to seal the tamped insulation surface, in accordance with manufacturer’s written instructions.

E. Clean-up:

1. Remove sprayed thermal insulation from material and surfaces not specifically required to be insulated.
2. Broom clean work areas affected by the Work of this Section.

3.6 INSTALLATION OF VAPOR BARRIER

A. Place vapor barriers on side of construction indicated on Drawings. Extend vapor barriers to extremities of areas to protect from vapor transmission. Secure vapor barriers in place with adhesives or other anchorage system as indicated. Extend vapor barriers to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor barriers over framing by lapping no fewer than two studs.

1. Fasten vapor barriers to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (406 mm) o.c.
2. Before installing vapor barriers, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor barriers with vapor-barrier tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
3. Firmly attach vapor barriers to metal framing and solid substrates with vapor-barrier fasteners as recommended by vapor-barrier manufacturer.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor barriers with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor barriers immediately before concealment by other work. Cover with vapor-barrier tape or another layer of vapor barriers.

3.7 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

SECTION 07 24 15 - POLYMER-BASED DIRECT APPLIED EXTERIOR FINISH SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Direct Applied Exterior Finish System over NEW HORIZONTAL Exterior Gypsum Soffit Board.
2. Direct Applied Exterior Finish System over VERICAL Shotcrete Walls.
3. Direct Applied Exterior Finish System over VERICAL Exterior Wall Stucco over Gypsum Sheathing at Fascia at Level 1 Staff Apartment Low Roofs.
4. Direct Applied Exterior Finish System over VERTICAL Exterior Wall Stucco over Gypsum Sheathing at Column Wrap B 1 at Level 0 and Level 1.
5. Direct Applied Exterior Finish System over VERTICAL Exterior Wall Stucco over Gypsum Sheathing over Rigid Insulation on Level 0, along Column Line 1 between column lines I and H.
6. Prefinished Metal Vented Reveals in DEFS Soffits.

B. Related Sections:

1. Division 09 Section "Gypsum Board" for exterior gypsum soffit board.

1.3 PERFORMANCE REQUIREMENTS

A. Exterior Finish System Performance: Comply with the following:

1. Bond Integrity: Free from bond failure within DEFS components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
2. Weathertightness: Resistant to water penetration from exterior into DEFS and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of DEFS and assemblies behind it, including substrates, supporting wall construction, and interior finish.

B. Class PB DEFS: Provide DEFS having physical properties and structural performance that comply with the following:

1. Abrasion Resistance: Sample consisting of 1-inch- (25.4-mm-) thick DEFS mounted on 1/2-inch- (12.7-mm-) thick gypsum board; cured for a minimum of 28 days; and showing no cracking, checking, or loss of film integrity after exposure to 528 quarts (500 L) of sand when tested per ASTM D 968, Method A.
2. Absorption-Freeze Resistance: No visible deleterious effects and negligible weight loss after 60 cycles per EIMA 101.01.
3. Accelerated Weathering: Five samples per ICC-ES AC219 showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, delamination, or other characteristics that might affect performance as a wall cladding after testing for 2000 hours when viewed under 5 times magnification per ASTM G 153 or ASTM G 154.
4. Freeze-Thaw: No surface changes, cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination, or indications of delamination between components when viewed under 5 times magnification after 60 cycles per EIMA 101.01.
5. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch (50.8-by-50.8-mm) clean glass substrate, cured for 28 days, and showing no growth when tested per ASTM D 3273 and evaluated according to ASTM D 3274.
6. Salt-Spray Resistance: No deleterious affects when tested according to ICC-ES AC219.
7. Tensile Adhesion: No failure in the DEFS, adhesive, base coat, or finish coat when tested per EIMA 101.03.
8. Water Penetration: Sample consisting of 1-inch- (25.4-mm-) thick DEFS mounted on 1/2-inch- (12.7-mm-)thick gypsum board, cured for 28 days, and showing no water penetration into the plane of the base coat to expanded-polystyrene board interface of the test specimen after 15 minutes at 6.24 lbf/sq. ft. (299 Pa) of air pressure difference or 20 percent of positive design wind pressure, whichever is greater, across the specimen during a test period when tested per EIMA 101.02.
9. Water Resistance: Three samples, each consisting of 1-inch- (25.4-mm-) thick DEFS mounted on 1/2-inch- (12.7-mm-) thick gypsum board; cured for 28 days; and showing no cracking, checking, crazing, erosion, rusting, blistering, peeling, or delamination after testing for 14 days per ASTM D 2247.
10. Wind-Driven-Rain Resistance: Resist wind-driven rain according to ICC-ES AC219.
11. Impact Resistance: Sample consisting of 1/2-inch- (25.4-mm-) thick DEFS when constructed with 1/2-inch cement board, conditioned, and tested per EIMA 101.86; and meeting or exceeding the following:

    a. High Impact Resistance: 90 to 150 inch-lb (10.2 to 17 J).

12. Structural Performance Testing: DEFS assembly and components shall comply with ICC-ES AC219 when tested per ASTM E 330.

1.4 SUBMITTALS

A. Product Data: For each type and component of DEFS indicated and for each Trim Accessory indicated.

B. Samples for Initial Selection: For each type of finish-coat color and texture indicated.

C. Samples for Verification: 24-inch- (600-mm-) square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work including.

D. Maintenance Data: For DEFS to include in maintenance manuals.

E. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For EIFS to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer who is certified in writing by manufacturer as qualified to install manufacturer's system using trained workers.

B. Source Limitations: Obtain DEFS from single source from single DEFS manufacturer and from sources approved by DEFS manufacturer as compatible with system components.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution and set quality standards for fabrication and installation.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Testing Agency Qualifications: Owner will engage an independent agency qualified for testing, to test Bond Integrity and Weathertightness of Direct Applied Exterior Finish System for all types of applications indicated on the drawings.

E. Composite Mockup Panel: Refer to drawing A-AS1.1 for configuration of Composite Mockup Panel and for materials and construction to be provided that are specified under this specification section.

1. Locate Composite Mockup Panel where indicated by Architect and facing a southerly direction.
2. Provide all the construction components that fall under this Polymer-Based Direct Applied Exterior Finish System (DEFS) and stucco specification that are indicated in the Composite Mockup Panel.
3. Approval of mockups is for color, texture, 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.

B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Maintain ambient temperatures above 40 deg F (4.4 deg C) for a minimum of 24 hours before, during, and after adhesives or coatings are applied. Do not apply DEFS adhesives or coatings during rainfall. Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit DEFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify actual dimensions required for prefabricated panels by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate installation of DEFS with related Work specified in other Sections to ensure that wall assemblies, including sheathing, weather-resistant sheathing paper, flashing, trim, and joint sealants are protected against damage from the effects of weather, age, corrosion, moisture, and other causes. Do not allow water to penetrate behind flashing and barrier coating of DEFS.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of DEFS that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Bond integrity and weathertightness.
    b. Deterioration of DEFS finishes and other DEFS materials beyond normal weathering.

2. Warranty coverage includes the following DEFS components:

    a. DEFS finish, including base coats, finish coats, and reinforcing mesh.
    b. DEIF accessories, including trim components and flashing.

3. Warranty Period: 10 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:

1. Acrocrete, Inc.
2. Corev America, Inc.
3. Dryvit Systems, Inc.
4. El Rey Stucco Company, Inc.; a brand of ParexLahabra, Inc.
5. Finestone; Degussa Wall Systems, Inc.
6. Master Wall, Inc.
7. Omega Products International, Inc.
8. Parex, Inc.; a brand of ParexLahabra, Inc.
9. Pleko LLC.
10. Senergy; Degussa Wall Systems, Inc.
11. SonoWall; Degussa Wall Systems, Inc.
12. Sto Corp.
13. Total Wall Inc.

2.2 MATERIALS

A. Compatibility: Provide adhesive, fasteners, reinforcing meshes, base- and finish-coat systems, sealants, and accessories that are compatible with one another and with substrates and approved for use by DEFS manufacturer for Project.

B. Primer/Sealer: DEFS manufacturer's standard substrate conditioner with VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), designed to seal substrates from moisture penetration and to improve the bond between substrate of type indicated and adhesive used for application of insulation.

C. VERTICAL Exterior Wall Stucco over Gypsum Sheathing: Bases of Design, StoPowerwall, DrainScreen.

1. Air and Water-resistive Barrier: Refer to specification section 072726 Fluid- Applied Membrane Air Barrier to be applied over 5/8” exterior gypsum wall sheathing specified under Section 061600 Sheathing.
2. Drainage Mat: Surface Burning, Nominal 1/4-inch (6 mm) tangled filament nylon core drainage mat with fabric facing. ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A Building Material. Flame Propagation, NFPA 285: meets requirements for use on noncombustible (Types I,II,III, and IV) construction as part of a stucco wall assembly.
3. Stucco Lath: Minimum 2.5 lb./yd2 (1.4 kg/m2) self-furred galvanized steel diamond mesh metal lath in compliance with ASTM C847.
4. Stucco Scratch and Brown Coat: Stucco scratch and brown coat material in compliance with ASTM C 926. Stucco material in compliance with ICC AC 11, listed by ICC ES.

a. Stucco thickness shall be uniform 3/4 inch or 7/8 inch (19 or 22 mm). Stucco thickness shall not exceed 7/8 inch (22 mm).
b. Stucco shall be applied in 2 coats, scratch and brown coat, to achieve the prescribed thickness.

5. Crack Defense Mesh Reinforcement: Nominal 4.5 oz./yd2 (153 g/m2), symmetrical, interlaced open-weave glass fiber mesh made with alkaline resistant coating embedded in base coat.

a. Compatible with materials in which the reinforcing mesh is embedded
b. System as required to achieve 10-year warranty.

D. VERTICAL Exterior Wall Stucco over Gypsum Sheathing over Rigid Insulation: Bases of Design, DrainScreen for **Exterior Wall System W-ST8-STO.**

1. Rigid Insulation: Extruded polystyrene foam-plastic board insulation. Refer to specification section 072100 Thermal Insulation.
2. Air and Water-resistive Barrier: Refer to specification section 072726 Fluid- Applied Membrane Air Barrier to be applied over 5/8" exterior gypsum wall sheathing specified under Section 061600 Sheathing.

a. Gypsum sheathing to be anchored through rigid insulation to steel studs with engineered fasteners engineered to support the weight of the sheathing and the stucco with the fastener spanning through the 2-inch thickness of the rigid insulation unsupported.

3. Drainage Mat: Surface Burning, Nominal ¼-inch (6 mm) tangled filament nylon core drainage mat with fabric facing. ASTM E 84: Flame Spread less than 25, Smoke Developed less than 450, Class A Building Material. Flame Propagation, NFPA 285: meets requirements for use on noncombustible (Types I,II,III, and IV) construction as part of a stucco wall assembly.
4. Stucco Lath: Minimum 2.5 lb./yd2 (1.4 kg/m2) self-furred galvanized steel diamond mesh metal lath in compliance with ASTM C847.
5. Stucco Scratch and Brown Coat: Stucco scratch and brown coat material in compliance with ASTM C 926. Stucco material in compliance with ICC AC 11, listed by ICC ES.

a. Stucco thickness shall be uniform 3/4 inch or 7/8 inch (19 or 22 mm). Stucco thickness shall not exceed 7/8 inch (22 mm).
b. Stucco shall be applied in 2 coats, scratch and brown coat, to achieve the prescribed thickness.

6. Crack Defense Mesh Reinforcement: Nominal 4.5 oz./yd2 (153 g/m2), symmetrical, interlaced open-weave glass fiber mesh made with alkaline resistant coating embedded in base coat.

a. Compatible with materials in which the reinforcing mesh is embedded
b. System as required to achieve 10-year warranty.

E. Direct Applied Exterior Finish System for VERITCAL Wall Stucco Applications and for direct applied over HORIZONTAL Exterior Gypsum Soffit board.

1. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other DEFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) per ASTM E 2098; complying with ASTM D 578 and the following:

    a. High-Impact Reinforcing Mesh: Not less than 15 oz./sq. yd. (509 g/sq. m)
    b. Strip Reinforcing Mesh: Not less than 3.75 oz./sq.yd. (127 g/sq.m)
    c. Detail Reinforcing Mesh: Not less than 4.0 oz./sq. yd. (136 g/sq. m)
    d. Corner Reinforcing Mesh: Not less than 7.2 oz./sq. yd. (244 g/sq. m)

2. Base-Coat Materials: DEFS manufacturer's standard mixture complying with one of the following:

    a. Job-mixed formulation of portland cement complying with ASTM C 150, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.
    b. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.
    c. Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.
    d. Factory-mixed noncementitious formulation of polymer-emulsion adhesive and inert fillers that is ready to use without adding other materials.

3. Primer: DEFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.
4. Finish-Coat Materials: DEFS manufacturer's standard acrylic-based coating with enhanced mildew resistance

    a. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.

        a. Aggregate: Manufacturers Standard.

5. Colors: As selected by Architect from manufacturer's full range.

F. Water: Potable.

G. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with DEFS manufacturer's written instructions.

1. Prefinished Metal Soffit Vent Reveals: Basis of Design: Fry Reglet DCS 625-V-200 vented reveal for installation in 5/8" thick gypsum soffit board.

    a. Prefinished Powder coat finish. Architect to select color from manufacturer’s full range of colors.

2. Expansion Joint: Prefabricated, one-piece V profile; designed for 5/8-thick soffit board designed to relieve stress of movement.

    a. Replace reveals with expansion joint trim such that expansion joint trim occurs at 20'-0" o.c. max. Coordinate locations with architect before proceeding.

2.3 ELASTOMERIC SEALANTS

A. Elastomeric Sealant Products: Provide DEFS manufacturer's listed and recommended chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials, and complies with requirements for products and testing indicated in ASTM C 1481 and with requirements in Division 07 Section "Joint Sealants" for products corresponding to description indicated below:

1. Multicomponent, nonsag urethane sealant.
2. Single-component, nonsag, neutral-curing silicone sealant.

B. Sealant Color: As selected by Architect from manufacturer's full range.

2.4 MIXING

A. General: Comply with DEFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as recommended by DEFS manufacturer. Mix materials in clean containers. Use materials within time period specified by DEFS manufacturer or discard.

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 DEFS.

B. Examine roof edges, wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where DEFS will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Begin coating application only after surfaces are dry.
2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of DEFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect DEFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind DEFS and deterioration of substrates.

C. Prepare and clean substrates to comply with DEFS manufacturer's written instructions to obtain optimum bond between substrate and adhesive for insulation.

3.3 VERTICAL EXTERIOR WALL STUCCO OVER GYPSUM SHEATHING AND RIGID INSULATION.

A. Air and Water-resistive Barrier: Refer to specification section 072726 Fluid- Applied Membrane Air Barrier to be applied over 5/8" exterior gypsum wall sheathing specified under Section 061600 Sheathing.

B. Continuous Insulation (where indicated): Attach insulation boards to framing with corrosion resistant bugle head metal screws and 1-1/4-inch metal lath locks or other corrosion resistant cap fastener. Use only enough fasteners (typically 3 per board mid-span) to temporarily hold the board in place. Sto TurboStick can also be applied on the back of the insulation board (minimum 4 – 8 vertical ribbons per board) to temporarily hold the insulation in place. (lath attachment is intended to permanently hold it in place).

1. Attach in courses with vertical joints staggered.
2. Tightly abut insulation board joints and interlock inside and outside corners. Trim or rasp board flush for square corners.
3. Seal gaps or open joints with spray foam and rasp or shave flush with surface.
4. Do not allow insulation board to be exposed to weather from more than 60 days.

C. Drainage Mat Installation: Place drainage mat against the wall surface and unroll horizontally with the fabric facing out. Hammer-tack or staple into sheathing with corrosion-resistant fasteners. Use as few fasteners as needed to hold the mat in place, starting from the bottom of the wall at base flashing or weep screed and working up. Do not fasten through flashing.

1. Shingle lap fabric at horizontal courses. Shingle lap drainage mat over flashing at floor lines, decks, roof lines, window heads, and other areas where flashing is required, to direct water to the exterior. Butt ends of rolls and vertical seams.
2. Trim around windows, doors, vents, or other penetrations through the wall.
3. Where stucco lath installation will not immediately follow installation of drainage mat, use corrosion-resistant cap nails, cap staples, or cap screws every 16 inches (406 mm) on center along framing for more secure attachment. Cover drainage mat with stucco within 30 days of installation.

D. Stucco Installation: Over Air and Water-resistive Barrier and Drainage Mat:

1. Weep Screed Installation: Install foundation weep screed at the base of the wall securely to solid substrate or framing with the appropriate fastener. Locate the foundation weep screed nosing minimum 2 inches (51 mm) above paved surfaces. Lap air and water-resistive barrier, sheet water-resistive barrier, and drainage mat over the weep screed attachment flange.
2. Casing Bead and Two Piece Expansion Joint Installation: Install casing beads at stucco terminations and through wall penetrations. Install two piece expansion joints over dissimilar construction or substrates, at changes in building height, at floor lines, and columns.

    a. Install full accessory pieces where possible and avoid small pieces. Seal adjoining pieces by embedding ends in sealant. Abut horizontal into vertical joint accessories (except where horizontal movement joints exist that prevent continuous vertical

runs of accessories). Attach at no more than 7 inches (178 mm) into solid substrate/framing with appropriate fasteners.

3. Lath Installation: Diamond Mesh Metal Lath to conform to ASTM C1063.

   a. General: Install metal lath with the long dimension at right angles to structural framing (horizontally on solid substrates). Terminate lath at expansion joints. Do not install continuously at joints.
   b. Seams/Overlaps: Overlap side seams minimum 1/2 inch (13 mm) and end seams minimum 1 inch (25 mm). Stagger end seams. Overlap casing beads and expansion joints minimum 1 inch (25 mm) over narrow wing accessories, minimum 2 inches (51 mm) over expanded flange accessories. Do not install lath continuously beneath expansion joints.
   c. Attachment: fasten securely into solid substrates or through sheathing into structural framing at 7 inches (178 mm) on center maximum vertically and 16 inches (406 mm) on center horizontally. Wire tie at no more than 9 inches (225 mm) on center at: side laps, accessory overlaps, and where end laps occur between supports.
   d. One Piece Expansion Joint Installation: Install one piece expansion joints at every 144 ft2 (13 m2) and every linear 20 feet. Wire tie one piece expansion joints to lath at no more than 7 inches (178 mm) on center. Seal adjoining pieces by embedding ends in sealant. Make certain lath is DISCONTINUOUS at or beneath joints.

   e. Inside and Outside Corners: Install corner lath at inside corners and corner bead at outside corners over lath. Attach through lath into solid substrate or framing at no more than 7 inches (178 mm) on center with appropriate fasteners.

4. Stucco Installation:

   a. Scratch Coat: Apply stucco with sufficient pressure to key into and embed the metal lath. Apply sufficient material, 3/8 or 1/2 inch (9 or 12 mm), to cover the metal lath and to permit scoring the surface. Score the stucco upon completion of each panel in preparation for a second coat. Score horizontally.
   b. Brown/Base Coat: As soon as the first coat is firm enough to receive the second coat without damage, apply the second coat. Alternatively, moist cure the first coat up to 48 hours and dampen the scratched surface with water immediately before applying the second coat. Apply the second coat with sufficient pressure to ensure intimate contact with the first coat and as needed to bring the stucco to a uniform thickness that matches the grounds of the accessories. Use a rod or straight edge to bring the surface to a true, even plane. Fill depressions in plane with stucco. Final thickness of stucco shall be uniform throughout the wall area and shall be either 3/4 inch or 7/8 inch (19 or 22 mm), as required by construction documents, and shall not exceed 7/8 inch (22 mm).
   c. Crack Defense: Apply base coat over the moist cured stucco with appropriate spray equipment or a stainless steel trowel to a uniform thickness of approximately 1/8 inch (3 mm). Work horizontally or vertically in strips of 40 inches (1016mm), and immediately embed the mesh into the wet base coat by troweling from the center to the edge of the mesh. Overlap mesh not less than 2-½ inches (64 mm) at mesh seams and at overlaps of detail mesh. Feather seams and edges. Avoid wrinkles in the mesh. The mesh must be fully embedded so that no mesh color shows through

the base coat when it is dry. Re-skim with additional base coat if mesh color is visible. Do not install base coat or mesh over joints or accessories in the stucco wall assembly.

d. Finish Surface: After the stucco has become slightly firm float the surface lightly with a darby or wood float to densify the surface and to provide a smooth, even surface. The proper time to float is when the wood float no longer sticks to the surface of the stucco.
e. Moist cure after the stucco has set by lightly fogging for at least 48 hours. Fog as frequently as required during the 48-hour period to prevent loss of moisture from the stucco. Avoid eroding the stucco surface with excess moisture. If relative humidity exceeds 75% the frequency of moist curing can be diminished.
f. Apply direct applied Finish System (DEFS) over Stucco as specified below.

3.4 DIRECT APPLIED EXTERIOR FINISH SYSTEM OVER VERITCAL WALL STUCCO and HORIZONTAL EXTERIOR GYPSUM SOFFIT BOARD

A. GENERAL

1. Comply with ASTM C 1397 and DEFS manufacturer's written instructions for installation of DEFS as applicable to each type of substrate indicated.

B. BASE-COAT INSTALLATION

1. Base Coat: Apply to exposed surfaces of vertical wall stucco and soffit board in minimum thickness recommended in writing by DEFS manufacturer, but not less than 1/16-inch (1.6-mm) dry-coat thickness.
2. Reinforcing Mesh: Embed type indicated below in wet base coat to produce wrinkle-free installation with mesh continuous at corners and overlapped not less than 2-1/2 inches (64 mm) or otherwise treated at joints to comply with ASTM C 1397 and DEFS manufacturer's written instructions. Do not lap reinforcing mesh within 8 inches (204 mm) of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are not visible.

    a. High-impact reinforcing mesh.

3. Additional Reinforcing Mesh:

    a. At aesthetic reveals, apply strip reinforcing mesh not less than 8 inches (200 mm) wide.
    b. Embed strip reinforcing mesh in base coat before applying first layer of reinforcing mesh.
    c. Provide corner reinforcing mesh at corners at outside corners
    d. Provide detail reinforcing mesh at changes in plane and at reveals and protrusions.

C. FINISH-COAT INSTALLATION

1. Primer: Apply over dry base coat according to DEFS manufacturer's written instructions.
2. Finish Coat: Apply over dry (and primed if required) base coat, maintaining a wet edge at all times for uniform appearance, in thickness required by DEFS manufacturer to

produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.

a. Texture: As selected by Architect from manufacturer's full range.
b. Embed aggregate in finish coat according to DEFS manufacturer's written instructions to produce a uniform applied-aggregate finish of color and texture matching approved sample.

D. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by DEFS manufacturer.

3.5 TRIM INSTALLATION

A. Trim: Apply trim accessories at perimeter of stucco and DEFS, at expansion joints, and elsewhere as indicated, according to DEFS manufacturer's written instructions. Coordinate with installation of soffit board.

1. Expansion Joint Trim; Locate at 20'-0" o.c. max. Coordinate locations with architect before proceeding.

3.6 INSTALLATION OF JOINT SEALANTS

A. Prepare joints and apply sealants, of type and at locations indicated, to comply with applicable requirements in Division 07 Section "Joint Sealants" and in ASTM C 1481.

1. Install 3/8” wide sealant and backer rod joint between all DEFS surfaces and adjacent surfaces of different materials.
2. Apply joint sealants after base coat has cured but before applying finish coat.
3. Clean surfaces to receive sealants to comply with indicated requirements and DEFS manufacturer's written instructions.
4. Apply primer recommended in writing by sealant manufacturer for surfaces to be sealed.
5. Install sealant backing to control depth and configuration of sealant joint and to prevent sealant from adhering to back of joint.
6. Apply masking tape to protect areas adjacent to sealant joints. Remove tape immediately after tooling joints, without disturbing joint seal.

3.7 CLEANING AND PROTECTION

A. Remove temporary covering and protection of other work. Promptly remove coating materials from window and door frames and other surfaces outside areas indicated to receive DEFS coatings.

END OF SECTION 07 24 15

SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section includes fluid-applied, vapor-permeable air and moisture barriers, and air and moisture barrier membrane flashing.

1. Vapor-permeable, fluid applied air barrier over sheathing.
2. Membrane flashing to wrap sheathing openings and doors and windows.

B. Related Requirements:

1. Section 061600 "Sheathing" for exterior wall sheathing over steel studs.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
2. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

B. Composite Mockup Panel: Refer to drawing A-AS1.1 for configuration of Composite Mockup Panel and for materials and construction to be provided that are specified under this Fluid Applied Membrane Air Barriers specification section.

1. Locate Composite Mockup Panel where indicated by Architect and facing a southerly direction.
2. Provide all the construction components that fall under this Fluid Applied Membrane Air Barriers specification that are indicated in the Composite Mockup Panel.
3. Inclusion of Fluid Applied Membrane Air Barriers in Composite Mockup if for providing full exterior wall assemblies associated with exterior material finishes and for general compliance with Sheathing specification, craftmanship and quality.

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.

C. In place Mockups: Build in place mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.
b. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

B. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

2.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

2.3 VAPOR-PERMEABLE MEMBRANE AIR-BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: acrylic membrane.

1. Basis of Design: Airlok Flex WG
   a. Approved Equal

2. Physical and Performance Properties:

   a. Air Permeance: Maximum 0.0005 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Vapor Permeance: Minimum 19 perms; ASTM E 96/E 96M.
   c. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.
   d. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

B. Air and Moisture Barrier Membrane Flashing.

1. Basis of Design: Airlok Sheet 400 NP

   a. Air and Moisture Barrier Membrane Flashing: 40-mil, laminated, modified-asphalt, self-adhesive sheet membrane bonded to a cross-laminated polyethylene sheet with the following characteristics:
   b. Approved Equal

      1) Air-Shield LMP

2. Physical and Performance Properties.

   a. Membrane Thickness: 40 Mils, ASTM D 1000
   b. Air Permeance: Maximum 0.0005 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   c. Vapor Permeance: Minimum .04 perms; ASTM E 96/E 96M.
   d. Ultimate Elongation: Minimum >800 percent; ASTM D 412, Die C.

2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material. All products recommended by the air barrier manufacturer to provide a complete air barrier system are to be provided and installed whether specified or not.

B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.

C. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

D. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."

E. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

D. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

E. Bridge isolation joints, expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

B. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

C. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames, with not less than 1 inch (25 mm) of full contact.

1. Transition Strip: Roll firmly to enhance adhesion.

D. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

3.4 JOINT AND FASTENER TREATMENT

A. Exterior Gypsum Sheathing:

1. Fill joints 1/4-inch wide a bead of sealant tooled to 20 mils thick onto a minimum of 1/2-inch beyond each side of the joint.
2. Fill joints greater than 1/4 inch wide (6 mm) with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

    a. If manufactures written recommended procedure for addressing joints greater than 1/4-inch vary from the description above, proceed with manufacturer’s instructions after receiving the architect’s approval.

3. Fully cover exposed fastener heads with a bead of sealant.

3.5 FLUID MOISTURE AND AIR-BARRIER INSTALLATION

A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.

1. Per manufacturers recommendations, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.

1. Vapor-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, **but not less than 40-mil dry film thickness**, applied in two equal coats.

C. Apply strip and transition strip a minimum of 1 inch (25 mm) onto cured air-barrier material according to air-barrier manufacturer's written instructions.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.6 AIR AND MOISTURE BARRIER MEMBRANE FLASHING INSTALLATION

A. Priming:

1. Apply primer to a cleaned, dust free surface by roller or spray at an average rate of 250-300 sq. ft. per gallon. Coverage rate will vary due to porosity of a substrate. Test substrates for coverage. Allow to dry per manufacturer’s directions. Do not thin liquid adhesive/sealant. Membrane can be applied when liquid adhesive becomes tacky.

B. Membrane Installation:

1. Install all materials following manufacturer’s guide specifications.
2. Pre-cut the selected self-adhered sheet Air and Moisture Barrier material into easy-to-handle pieces.
3. Peel the silicone-coated release sheet off, then start applying the membrane with pressure. Use a hand roller to assure that self-adhered sheet Air and Moisture Barrier material is adhered to primed substrate. System is applied in a shingled method to shed water.

4. Install the selected self-adhered sheet Air and Moisture Barrier material to primed substrate beginning at the base of the wall.
5. All overlaps of barrier membrane are to be a minimum 2 1/2-inch side lap, a minimum 4-inch end lap.
6. Overlaps over through wall flashing to be a minimum of 4-inches.
7. Install the self-adhered sheet Air and Moisture Barrier material in ambient and substrate surface temperatures of 40°F (5°C) and rising. Conduct a field adhesion test at temperatures below 40°F (5°C) prior to application.
8. Seal any cuts or edges in the membrane due to tie wires, pipes and other penetrations with manufacturers sealant.
9. Repair punctures, voids, and deficient lapped seams in flashing. Slit and flatten fishmouths and blisters. Patch with flashing extending 6 inches (150 mm) beyond repaired areas in strip direction.
10. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Re-prime areas exposed for more than 24 hours.
11. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats recommended by air barrier manufacturer to achieve required bond, with adequate drying time between coats.
12. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
13. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
14. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
15. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

C. Protection

1. Membranes should be covered within sixty (60) days to prevent impaired performance due to prolonged exposure to sunlight.
2. Cover the membrane when applicable in a manner that prevents damage to the material.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Air-barrier dry film thickness.

3. Masonry surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Continuous structural support of air-barrier system has been provided.
5. Site conditions for application temperature and dryness of substrates have been maintained.
6. Maximum exposure time of materials to UV deterioration has not been exceeded.
7. Surfaces have been primed, if applicable.
8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
9. Termination mastic has been applied on cut edges.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.

C. Tests: As determined by Owner's testing agency from among the following tests:

1. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E 783.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.8 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26

SECTION 07 42 13.19 - INSULATED METAL WALL PANELS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Foamed-insulation-core horizontal and vertical metal wall panels with integral reveals and related metal trim and accessories.

1.3 RELATED REQUIREMENTS

A. Division 01 Section "Sustainable Design Requirements" for related LEED general requirements.

B. Division 05 Section "Cold-Formed Metal Framing" for support framing for insulated core metal wall panels.

C. Division 07 Section "Fluid-Applied Membrane Air Barriers" for air/moisture barrier behind metal panels

D. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.

E. Division 07 Section "Joint Sealants" for field-applied joint sealants.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.

4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review temporary protection requirements for metal panel assembly during and after installation.
7. Review procedures for repair of metal panels damaged after installation.
8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Foamed-insulation-core metal wall panels.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

C. Shop Drawings:

1. 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.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

E. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. 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 metal panel assembly including supports, attachments, and accessories.

C. Composite Mockup Panel:

1. Construction of one Composite Mockup Panel after approval of mockups indicated above.

a. Refer to drawing A-AS1.1 for configuration of composite mockup panels which is to include all exterior materials and components include on the drawing of the composite mockup panel.

2. Provide all the construction components that fall under this Insulated Metal Wall Panels specification that are indicated in the Composite Mockup Panel.
3. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects against other exterior materials and construction to connection to adjacent materials.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

D. First Install In-Place Mockup:

1. Build mockups to set quality standards for fabrication and installation of building components.
2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration in accordance with AAMA 501.2.
3. Subject to compliance with requirements, approved of First Install In-Place mockups are to become part of the completed Work.

1.9 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.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested in accordance with ASTM D2244.

b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
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 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing in accordance with ASTM E72:

1. Wind Loads: As indicated on drawing A-S0.2
2. Other Design Loads: As indicated on drawing A-S0.2
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested in accordance with ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

C. Water Penetration under Static Pressure: No water penetration when tested in accordance with ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 15 lbf/sq. ft. (720 Pa).

D. 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): 180 deg F (100 deg C), material surfaces.

E. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E119.
2. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which wall panel is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
3. Radiant Heat Exposure: No ignition when tested in accordance with NFPA 268.
4. Potential Heat: Acceptable level when tested in accordance with NFPA 259.

5. Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E84.
6. UL 263 - Fire Tests of Building Construction and Materials.
7. UL 1040 - Fire Test of Insulated Wall Construction.

2.2 FOAMED-INSULATION-CORE METAL WALL PANELS

A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

1. Insulation Core: Modified isocyanurate or polyurethane foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.

    a. Closed-Cell Content: 90 percent when tested in accordance with ASTM D6226.
    b. Density: 2.5 to 3.5 lb/cu. ft. (32 to 42 kg/cu. m) when tested in accordance with ASTM D1622.
    c. Compressive Strength: Minimum 20 psi (140 kPa) when tested in accordance with ASTM D1621.
    d. Shear Strength: 26 psi (179 kPa) when tested in accordance with ASTM C273/C273M.

B. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

1. Nominal Thickness Exterior Sheet: 0.022 inch (0.56 mm).
2. Nominal Thickness Interior Liner Sheet: 0.018 inch (0.46 mm).
3. Exterior Finish: Two-coat fluoropolymer system. 02. mil primer with 0.8 mil 70 percent PVDF fluoropolymer color coat, AAM 621

    a. Color: As selected by Architect from manufacturer's full range and custom colors.

4. Interior Linear Panel Finish: 0.2 mil primer with 0.6 mil acrylic color coat.

    a. Color: As selected by Architect from manufacturer's full range.

5. Panel Coverage: See basis of design products listed below.
6. Thermal-Resistance Value (R-Value): In accordance with ASTM C1363.

    a. 2-inch thick Panels: R-16
    b. 3-inch thick panels: R-24.1

C. **Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels** formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and

mechanically attaching panels to supports using concealed clips or fasteners. **Basis of Design Products as Follows for Each Condition:**

1. **Vertical Building Wall Panels (including lower level of penthouse wall opening infill panels):** CENTRIA FWDS, Vertical Panels, 3-inch thick by 32-inch wide, with exterior flat embossed sheet and interior embossed-planked sheet, custom color exterior finish.

2. **Horizontal Building Wall Panels:** CENTRIA FWDS, Horizontal Panels with IMV (Insulated Metal Vertical) Joints, 3-inch thick by 30-inch wide, with exterior flat embossed sheet and interior embossed-planked sheet, custom color exterior finish.

3. **Upper Level Penthouse Wall Panels:** CENTRIA FWDS, Horizontal Panels, 2-inch thick by 30-inch wide, with exterior flat embossed sheet and interior embossed-planked sheet, standard color exterior finish.

D. Manufacturers: Provide the Basis of Design product or equal product acceptable to the Architect by one of the following manufacturers:

1. ATAS International
2. Metl Span, Nucor Company

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy 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 rakes, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

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, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide concealed fasteners.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 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.

1. Panel Bow Tolerance: Not more than 0.5 percent of panel width or length.

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.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions.

    a. Exposed fasteners are not allowed on faces of accessories exposed to view.

5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are 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.

C. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine steel framing at screen walls to verify that girts, angles, studs, channels, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION OF METAL PANELS

A. General: Install metal panels in accordance with manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.4 INSTALLATION OF INSULATION-CORE METAL WALL PANELS

A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.

1. Fasten foamed-insulation-core metal wall panels to supports with concealed fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
3. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
4. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.

B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.

1. Install clips to supports with self-tapping fasteners.

C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

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. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Water-Spray Test: After installation, test for water penetration in accordance with AAMA 501.2.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

D. Metal wall panels will be considered defective if they do not pass test and inspections.

E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.6 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.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.19

SECTION 074213.23 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal composite material (MCM) panels.
2. Metal composite material (MCM) accessories

B. Related Requirements:
1. Section 019119 "General Commissioning Requirements."

1.2 DEFINITIONS

A. MCM: Metal composite material; cladding material formed by joining two thin metal skins to polyethylene or fire-retardant core and bonded under precise temperature, pressure, and tension.

B. PER: Pressure-equalized rainscreen system designed for no water intrusion, with equal pressure within air cavity and outside cladding barrier.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**.

1. Meet with Owner, Architect, Owner's insurer if applicable, MCM system Installer, MCM system manufacturer's representative, and installers whose work interfaces with or affects MCM panels, including installers of soffit panels and roofing.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to MCM system installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect MCM system.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for system assembly during and after installation.
8. Review procedures for repair of panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of MCM system; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, accessories, and special details.
2. Accessories: Include details of flashing, trim, and anchorage, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
3. Provide signed and sealed drawings, by a qualified design professional in Project jurisdiction, of MCM system showing compliance with performance requirements and design criteria identified for this Project.

C. Samples for Initial Selection: For each type of MCM panel indicated, with factory-applied color finishes.

1. Size: **Manufacturers' standard size**.
2. Include Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of **MCM panel** required, with factory-applied color finishes.

1. MCM Panel: **Two samples**, **Manufacturers' standard size**.

E. Delegated Design Submittals: For MCM system, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Coordinate with metal stud design.

F. Sustainable Design Submittals:
1. Environmental Product Declaration: For each product OR
2. Third-Party Certifications: For each product OR
3. Third-Party Certified Life Cycle Assessment: For each product.

1.5 INFORMATIONAL SUBMITTALS

A. Test and Evaluation Reports:

1. Product Test Reports: For each **product**, for tests performed by **qualified testing agency**.

a. MCM Panel Manufacturer's Material Test Reports: Certified test reports showing compliance with specific performance or third-party listing documenting compliance in accordance with the IBC.

b. Fabricator's MCM System Test Reports: Certified test reports showing system compliance with specific performance or third-party listing documenting compliance in accordance with the IBC.

1) **Dry** or **Wet** Seal System: Tested to AAMA 501.1.
2) DBVC System: Tested to AAMA 509.
3) PER System: Tested to AAMA 508.

2. Preconstruction Test Reports: For MCM system.

B. Field Quality-Control Submittals:

1. Field quality-control reports.

C. Qualification Statements: For **Installer**.

D. Delegated design engineer qualifications.

E. Sample warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For MCM panels.

B. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: **Minimum 5 years' experience**.
2. Fabricator: **Approved by MCM panel manufacturer**
3. Installer: **Entity that employs installers and supervisors who are trained and approved by MCM system manufacturer**.
4. Delegated Design Engineer: A professional engineer who is legally qualified to practice in **state** where Project is located and who is experienced in providing engineering services of the type indicated.
5. Testing Agency: An agency acceptable to authorities having jurisdiction.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, MCM panels, and other manufactured items so as not to be damaged or deformed. Package MCM panels for protection during transportation and handling.

B. Unload, store, and erect MCM panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack MCM panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store MCM panels to ensure dryness, with positive slope for drainage of water. Do not store MCM panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on MCM panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of MCM panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate MCM 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. Panel Integrity Warranty: Manufacturer agrees to repair or replace components of MCM panels that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: **5** years from date of Substantial Completion.

B. Panel Finish Warranty: Manufacturer agrees to repair finish or replace MCM panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: **20** years from date of Substantial Completion.

C. MCM System Warranty: **Fabricator's** standard form in which manufacturer agrees to repair or replace components of MCM systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: **Five** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design MCM system.

B. Structural Performance: MCM systems to withstand the effects of the following loads, based on testing in accordance with ASTM E330/E330M:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: **As indicated on Drawings**.
3. Deflection Limits: For wind loads, no greater than **1/180** of the span.

C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested in accordance with ASTM E283/E283M at the following test-pressure difference:

1. Test-Pressure Difference: **6.24 lbf/sq. ft. (300 Pa)**.

D. Water Penetration under Static Pressure: No water penetration when tested in accordance with ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: **6.24 lbf/sq. ft. (300 Pa)**.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: **120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces**.

F. Fire Propagation Characteristics: MCM system passes NFPA 285 testing.

2.2 METAL COMPOSITE MATERIAL (MCM) WALL PANELS

A. MCM Wall Panel Systems: Provide factory-formed and -assembled, MCM wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components**, panel stiffeners**, and accessories required for weathertight system.

1. Basis-of-Design Product: Subject to compliance with requirements, provide ALUCOBOND®; 3A Composites USA Inc.; ALUCOBOND® PLUS or comparable product by one of the following:

a. Arconic Architectural Products (USA).
b. Mitsubishi Chemical Composites.

B. MCM Panel Materials:

C. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick, **coil-coated** or anodized aluminum sheet facings (see drawings for locations).
   1. Panel Thickness: **0.157 inch (4 mm)**.
   2. Core: Standard.
   3. Exterior Finish at Fascia Panel: PVDF fluoropolymer.
      a. Color: As indicated on drawings.
   4. Peel Strength: 22.5 in-lb/in. (100 N x mm/mm) when tested for bond integrity in accordance with ASTM D1781.
   5. Fire Performance: Flame spread less than 25 and smoke developed less than 450, in accordance with ASTM E84.

D. Attachment Assembly Components: Formed from extruded aluminum.

E. Attachment Assembly: Manufacturer's standard.

2.3 METAL COMPOSITE MATERIAL (MCM) SYSTEM

A. Wet-Seal Barrier MCM System: Provide factory-formed and -assembled, MCM panels formed into profile for wet-seal barrier system installation. Include attachment assembly components**, panel stiffeners**, sealants, and accessories required for weathertight system.

B. System Panel Depth: **As indicated on drawings**.

C. Attachment Assembly Components: **Manufacturer's standard clips** from **extruded aluminum**.

D. Labeling: Comply with labeling requirement of applicable building code.

2.4 ACCESSORIES

A. Metal Subframing and Furring: ASTM C955 cold-formed, metallic-coated steel sheet ASTM A653/A653M, G90 (Z275) hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of MCM system.

B. System Accessories: Provide components required for a complete, weathertight wall system including bearing plates, trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of MCM panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as MCM panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, corners, endwalls, fasciae, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent MCM panels.
   1. Thickness: Formed with 0.040-inch (1.00-mm-) thick, coil-coated aluminum sheet facings.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Use gasketed or approved coated fasteners between dissimilar metals.

1. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
2. Provide exposed fasteners with heads matching color of MCM panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in MCM panels and remain weathertight; and as recommended in writing by MCM system manufacturer.

2.5 FABRICATION

A. Fabricate and finish MCM panels at the factory, by panel manufacturer's standard procedures and processes, as necessary to fulfill indicated panel performance requirements demonstrated by laboratory testing.

B. Shop-fabricate MCM systems and accessories by fabricator's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with requirements of MCM panel manufacturer, of indicated system profiles, and with dimensional and structural requirements.

1. Fabricate panels to dimensions indicated on Drawings based on an assumed design temperature of 70 deg F (21 deg C). Allow for ambient temperature range at time of fabrication.
2. Formed MCM panel lines, breaks, and angles to be sharp and straight, with surfaces free from warp or buckle.
3. Fabricate panels with sharply cut edges and no displacement of face sheet or protrusion of core.
4. Fabricated Panel Tolerances: Shop-fabricate panels to sizes and joint configurations indicated on Drawings.

    a. Width: Plus or minus 0.079 inch (2 mm) at 70 deg F (21 deg C).
    b. Length: Plus or minus 0.079 inch (2 mm) at 70 deg F (21 deg C).
    c. Squareness: Plus or minus 0.079 inch (2 mm) at 70 deg F (21 deg C).

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams.

4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal manufacturer for application, but not less than thickness of metal being secured.

2.6 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Coil-Coated **Aluminum** Finish:

1. PVDF Fluoropolymer: AAMA 2605, **three-coat** fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

D. Anodized Aluminum Finish:
1. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, MCM system supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by MCM system manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by MCM system manufacturer.

    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and assemblies penetrating MCM system to verify actual locations of penetrations relative to seam locations of MCM panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and MCM panel manufacturer's written recommendations.

3.3 INSTALLATION OF MCM SYSTEM

A. General: Install MCM system in accordance with system manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor MCM system securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving MCM system.
2. Flash and seal MCM system at perimeter of all openings. Fasten with self-tapping screws.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as MCM system work proceeds.
6. Align bottoms of MCM panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
7. Provide weathertight escutcheons for all items penetrating system.
8. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action **as recommended in writing by MCM system manufacturer**.
9. Attach MCM panels to supports at locations, spacings, and with fasteners recommended by manufacturer to meet listed performance requirements.

B. Attachment Assembly, General: Install attachment assembly required to support MCM panels and to provide a complete weathertight wall system, including tracks, drainage channels, anchor channels, perimeter extrusions**, and panel clips**.

1. Install subframing, furring, and other panel support members and anchorages in accordance with ASTM C955.
2. Install support system at locations, at spacings, and with fasteners recommended by MCM system manufacturer to meet listed performance requirements.

C. Panel Installation: Attach MCM wall panels to supports at locations, spacings, and with fasteners recommended by Fabricator to achieve performance requirements specified.

D. Wet Seal Systems: Seal horizontal and vertical joints between adjacent MCM wall panels with sealant backing and sealant. Install sealant backing and sealant in accordance with requirements specified in Section 079200 "Joint Sealants."

a. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended in writing by Fabricator. Attach routed-and-returned flanges of wall panels to panel clips with Fabricator's standard fasteners.
b. Panel Installation:
   1) Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant in accordance with requirements specified in Section 079200 "Joint Sealants."
   2) Seal horizontal and vertical joints between adjacent MCM wall panels with Fabricator's standard gaskets.
c. Joint Sealing: Seal all joints in accordance with AAMA 501.

E. Installation: Attach metal composite material wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.

1. Wet Seal Systems: Seal horizontal and vertical joints between adjacent metal composite material wall panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 079200 "Joint Sealants."

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform field tests and inspections.

B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.

C. Metal composite material wall panels will be considered defective if they do not pass test and inspections.

D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.

B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.23

SECTION 07 42 93 - SOFFIT PANELS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section includes metal soffit 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.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. 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.
2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

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 metal panel installation with rain drainage work, flashing, trim, construction of walls, 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. Failures include, but are not limited to, the following:

    a. Structural failures including rupturing, cracking, or puncturing.
    b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 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 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft..

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft..

D. 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 METAL SOFFIT PANELS

A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Flush-Profile Metal Soffit Panels **Solid and Perforated** panels formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Architectural Building Company
   b. ATAS International, Inc.
   c. Berridge Manufacturing Company
   d. CENTRA Architectural Systems
   e. Dimensional Metals Inc.
   f. Drexel Metals
   g. Englert, Inc.
   h. Fabral
   i. Firestone Building Products
   j. Innovative Metals Company
   k. Knotwood
   l. MBCI
   m. Merchant and Evans
   n. Metal Sales Manufacturing
   o. PAC-CLAD, Petersen Aluminum
   p. Ultra Seam Incorporated

2. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

   a. Thickness: 0.032 inch.
   b. Surface: Smooth, flat finish.
   c. Exterior Finish: Two-coat fluoropolymer.
   d. Color: As selected by Architect from manufacturer's full range.

3. Panel Configuration:

   a. Flush Solid Panels: 12-inches wide
   b. Flush Perforated Panels: 12-inches wide
   c. Perforations on Perforated Panels: Provide flush wide vent with venting the full width of the 12-inch panel
   d. Panels to be 1-inch high with vertical leg on one side for anchorage to substrate and with cleat to receive loose end of adjacent panel.

2.3 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

B. Trim: Provide trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish trim with same finish system as adjacent metal panels.

C. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide concealed fasteners.

D. Exposed fasteners are not allowed on faces of accessories exposed to view. Exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

2.4 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. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. **Conceal fasteners and expansion provisions wherever possible.** Exposed fasteners are not allowed on faces of accessories exposed to view.
4. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are 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, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Fasten with self-tapping screws.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install trim as metal panel work proceeds.

B. Fasteners:

1. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.

4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

F. 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 are permanently watertight.

1. Install exposed flashing and trim that is without buckling, and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. 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 expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.3 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.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 93

SECTION 07 54 23 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Adhered thermoplastic polyolefin (TPO) roofing system.
2. Roof insulation.
3. Walkways.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings, copings, and counterflashings.
3. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
4. Section 220010 "General Provisions - Plumbing" for roof drains.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Construction Manager, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane termination details.
3. Flashing details at penetrations.
4. Tapered insulation layout, thickness, and slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Tie-in with adjoining air barrier.

C. Samples for Verification: For the following products:

1. Roof membrane and flashings, of color required.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of compliance with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is listed in FM Approvals' RoofNav for roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, roofing accessories, and other components of roofing system.

2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.

1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:

1. Refer to Structural Drawing S0.2 Basis of Design for Uplift Pressure Chart for Zones 1, 2 and 3.

D. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.

1. Fire/Windstorm Classification: Class 1A-90.
2. Hail-Resistance Rating: FM Global Property Loss Prevention Data Sheet 1-34 SH.

E. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

F. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

A. TPO Sheet: ASTM D6878/D6878M, internally fabric- or scrim-reinforced, fabric-backed TPO sheet.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carlisle SynTec Incorporated.
b. Custom Seal Roofing.
c. Firestone Building Products.
d. GAF.
e. GenFlex Roofing Systems.
f. Johns Manville; a Berkshire Hathaway company.
g. Mule-Hide Products Co., Inc.
h. Versico Roofing Systems.

2. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.
3. Thickness: 60 mils (1.5 mm), nominal.
4. Exposed Face Color: White.

2.3 ACCESSORY ROOFING MATERIALS

A. General: Accessory materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

2. Verify adhesives and sealants comply with the following limits for VOC content:

a. Plastic Foam Adhesives: 50 g/L.
b. Gypsum Board and Panel Adhesives: 50 g/L.
c. Multipurpose Construction Adhesives: 70 g/L.
d. Fiberglass Adhesives: 80 g/L.
e. Contact Adhesives: 80 g/L.
f. PVC Welding Compounds: 510 g/L.
g. Other Adhesives: 250 g/L.
h. Single-Ply Roof Membrane Sealants: 450 g/L.
i. Nonmembrane Roof Sealants: 300 g/L.
j. Sealant Primers for Nonporous Substrates: 250 g/L.
k. Sealant Primers for Porous Substrates: 775 g/L.

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils (1.4 mm)] thick, minimum, of same color as TPO sheet.

C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

D. Bonding Adhesive: Manufacturer's standard.

E. Slip Sheet: Manufacturer's standard, of thickness required for application.

F. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

G. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick (25 mm wide by 1.3 mm thick), prepunched.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

1. Pourable Sealer Pocket: Molded accessory by roofing manufacturer designed, engineered and formulated for use with TPO single-ply membranes. Of size and depth to accommodate project conditions detailed on drawings.

a. Manufacturer’s standard pourable sealer over non-shrink grout under sealant.

2.4 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicatedand that produce FM Approvals-approved roof insulation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class I, Grade 3, felt or glass-fiber mat facer on both major surfaces.

1. Base Insulation Thickness: 4-inch thick, minimum R-20.

C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

D. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation with minimum R-Value of R-5 per inch.
2. Minimum Thickness: 1/4 inch (6.35 mm).
3. Slope:

a. Roof Field: 1/4 inch per foot (1:48) unless otherwise indicated on Drawings.

1) 1/8-inch per foot (1:96) at the main roof area where the existing concrete roof deck is confirmed to slope a minimum of 1/8-inch per foot as indicated in the notes on drawing A-A1.5.

b. Saddles and Crickets: 1/2 inch per foot (1:24) unless otherwise indicated on Drawings.

2.5 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Full-spread, spray-applied, low-rise, two-component urethane adhesive.
2. Verify adhesives and sealants comply with the following limits for VOC content:

a. Plastic Foam Adhesives: 50 g/L.
b. Gypsum Board and Panel Adhesives: 50 g/L.
c. Multipurpose Construction Adhesives: 70 g/L.
d. Fiberglass Adhesives: 80 g/L.
e. Contact Adhesives: 80 g/L.
f. PVC Welding Compounds: 510 g/L.
g. Other Adhesives: 250 g/L.
h. Single-Ply Roof Membrane Sealants: 450 g/L.
i. Nonmembrane Roof Sealants: 300 g/L.
j. Sealant Primers for Nonporous Substrates: 250 g/L.
k. Sealant Primers for Porous Substrates: 775 g/L.

D. Pourable Sealer Pocket: In accordance with manufacturer's written instruction heat weld flange a minimum of 2-inches to reinforced roof membrane. Prime inside of TPO sealant pocket, nstall non-shrink grout in pocket under sealant and pour sealant over grout in accordance with manufacturer's written instructions.
   1. Allow 2-inches of clearance around the projection. If multiple projections occur allow 1-inch clearance between projections and pocket.

2.6 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch (5 mm) thick and acceptable to roofing system manufacturer.

   1. Size: Approximately 36 by 60 inches (914 by 1524 mm).
   2. Color: Contrasting with roof membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

   1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
   2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
   3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

C. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Section 072726 "Fluid-Applied Membrane Air Barriers."

3.4 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Metal Decking:

1. Install base layer of insulation with end joints staggered not less than 12 inches (305 mm) in adjacent rows and with long joints continuous at right angle to flutes of decking.

    a. Locate end joints over crests of decking.
    b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    c. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
    d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).

        1) Trim insulation so that water flow is unrestricted.

    e. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
    f. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

D. Installation Over Concrete Decks:

1. Adhere base layer and subsequent layers of insulation to concrete roof deck according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
2. Set insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

a. Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
b. Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

3. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches (305 mm) from previous layer of insulation.
   a. Install with long joints continuous and with end joints staggered not less than 12 inches (305 mm) in adjacent rows.
   b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
   c. Make joints between adjacent insulation boards not more than 1/4 inch (6 mm) in width.
   d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches (610 mm).

      1) Trim insulation so that water flow is unrestricted.

   e. Fill gaps exceeding 1/4 inch (6 mm) with insulation.
   f. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.
   g. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

      1) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.5 INSTALLATION OF ADHERED ROOF MEMBRANE

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owner's testing and inspection agency.

D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.

G. Apply roof membrane with side laps shingled with slope of roof deck where possible.

H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.6 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.7 INSTALLATION OF WALKWAYS

A. Flexible Walkways:

1. Install flexible walkways at the following locations:

a. Perimeter of each rooftop unit.
b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
d. Top and bottom of each roof access ladder.
e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
f. Locations indicated on Drawings.
g. As required by roof membrane manufacturer's warranty requirements.

2. Provide 6-inch (76-mm) clearance between adjoining pads.
3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.10 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <Insert name of Owner>.
2. Address: <Insert address>.
3. Building Name/Type: <Insert information>.
4. Address: <Insert address>.
5. Area of Work: <Insert information>.
6. Acceptance Date: _____.
7. Warranty Period: <Insert time>.
8. Expiration Date: _____.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

    a. lightning;
    b. peak gust wind speed exceeding 55 mph (m/sec);
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 07 54 23

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Formed Products:

a. Prefinished metal counterflashing.
b. Prefinished metal copings.
c. Low-slope roof sheet metal fabrications.
d. Equipment support flashing.
e. Custom fabricated metal building expansion joint covers.

B. Related Sections:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. FM Approvals Listing: Manufacture and install copings and roof edge flashings] that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) 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 for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of 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 joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including and counterflashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.
9. **Details of metal building expansion joint covers on horizontal roof surface, up adjacent building walls and base flashing connections to back side of parapet walls. Shop drawings shall illustrate contractor's interpretation and development of metal building expansion joint details shown on architectural drawings.**

    a. Indicating anchorage locations including types and spacing of fasteners.
    b. Indicate direction of expansion and contraction and the extent of expansion and contraction movement allowed by system.
    c. Building expansion joints are 4-inches wide and are to allow for 50% movement with the joint reduced to 2-inches wide and increased to 6-inches wide with the building movement.
    d. Provide details illustrating all conditions at a minimum scale of 3" = 1'-0".

C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

A. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches (300 mm) long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches (300 mm) long and in required profile. Include fasteners and other exposed accessories.

B. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

C. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

C. Provide mockup of each flashing condition for approval by the Architect using actual materials to be installed on the project. Mockup may be incorporated into the final work.

D. Preinstallation Conference: Conduct conference as part of Pre-Roof Conference.

1. Review methods and procedures related to sheet metal flashing and trim.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim 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 specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

1. Surface: Smooth, flat.
2. Color: Except where noted otherwise below Custom Color selected by the Architect to match adjacent work with the following finish:

a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instruction

3. Aluminum Sheet concealed to view from the exterior with being below the top of the parapet wall along the main roof ONLY, provide the following:

a. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane, polysulfide or silicone polymer sealant; low modulus; 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 emulsion complying with ASTM D 1187.

2.3 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, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. 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.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form 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.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

E. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.

F. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

G. Fabricate continuous cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

H. Fabricate continuous cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

I. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

J. Do not use graphite pencils to mark metal surfaces.

2.4 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) Fascia Cap: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Joint Style: Overlapped, 4 inches (100 mm) wide
2. Fabricate from the following materials:

a. Aluminum: 0.050 inch (1.27 mm)thick.

1) Surface: Smooth, flat finish.
2) Finish: Two-coat fluoropolymer.
3) Color: Custom Color selected by the Architect to match adjacent work.

B. Copings:

1. Metal Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, solder or weld watertight. Shop fabricate interior and exterior corners.

a. Aluminum: 0.050 inch (1.27 mm)thick.

1) Surface: Smooth, flat finish.
2) Finish: Two-coat fluoropolymer.
3) Color: As selected by Architect from manufacturer’s full range.

C. Building Expansion-Joint Covers: Shop fabricate interior and exterior corners. Fabricate roof and roof-to-exterior wall transition and roof-to-parapet wall transitions.

1. Stainless Steel: 0.067 inch (1.70 mm) thick.

2.5 ROOF SHEET METAL FABRICATIONS

A. Counterflashing: Fabricate from the following materials:

1. Aluminum: 0.032 inch (0.81 mm) thick.

B. Roof-Penetration Flashing: Fabricate from the following materials:

1. Copper: 16 oz./sq. ft. (0.55 mm) thick
2. Stainless Steel: 0.019 inch (0.48 mm) thick.
3. Zinc-Tin Alloy-Coated Stainless Steel: 0.018 inch (0.46 mm) thick.

2.6 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Copper: 16 oz./sq. ft. (0.55 mm thick).
2. Stainless Steel: 0.0188 inch (0.477 mm) thick.
3. Zinc-Tin Alloy-Coated Copper: 16 oz./sq. ft. (0.55 mm thick).

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 the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. 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. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. 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.
3. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated on shop drawings.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

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 SMACNA.

1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. 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 sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws and metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel and aluminum sheet.
2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
3. Copper Soldering: Tin edges of uncoated copper sheets using solder for copper.

G. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal 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 and weather resistant.

B. Roof Edge Flashing:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor with concealed fasteners and continuous cleats.
3. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.
4. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.

    a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch (400-mm) centers.
    a. Interlock interior bottom edge of coping with continuous cleat anchored to substrate at 16-inch (400-mm) centers.

3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

D. 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 (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant.

E. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless steel draw band and tighten.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.4 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

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.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. 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

SECTION 07 72 00 - ROOF ACCESSORIES

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof curbs.
2. Roof hatches.
3. Pipe and duct supports.
4. Pipe portals.

B. Related Requirements:

1. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, coping, and miscellaneous sheet metal trim and accessories.
2. Section 230502 “Dedicated Outdoor Air Unit” for roof curbs to be provided with unit.
3. Section 230548 “Vibration and Isolation and Seismic/Wind Restraint for rooftop unit curbs and isolation systems.

1.3 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Wind-Restraint Performance: As indicated on Drawing S0.2.

2.2 ROOF CURBS

A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides or stepped integral metal cant raised the thickness of roof insulation to suit condition and roofing requirements and integrally formed deck-mounting flange at perimeter bottom.

1. Provide roof curbs required that are not otherwise specified in sections referenced under 1.2 B Related Requirements of this specification.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Supported Load Capacity: Coordinate load capacity with equipment to be supported.

D. Steel: Zinc-coated (galvanized) steel sheet, 0.064 inch (1.63 mm) thick.

1. Finish: Mill phosphatized.

E. Construction:

1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
3. Fabricate curbs to minimum height of 8 inches (203 mm) above roofing surface unless otherwise indicated.
4. Top Surface: Level top of curb, with roof slope accommodated.
5. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
6. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
7. Liner: Same material as curb, of manufacturer's standard thickness and finish.
8. Nailer: Factory-installed pressure treated wood nailer along top flange of curb continuous around curb perimeter where required to secure equipment.
9. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
10. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.

2.3 ROOF HATCHES

A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, or stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.

B. Type and Size:

1. Single-leaf lid, 30 by 36 inches (750 by 900 mm)

C. Loads: Minimum 40-lbf/sq. ft. (1.9-kPa) external live load and 20-lbf/sq. ft. (0.95-kPa) internal uplift load.

D. Hatch Material, Steel: Zinc-coated (galvanized) steel sheet.

1. Thickness: 0.079 inch (2.01 mm).
2. Finish: Two-coat fluoropolymer.
3. Color: As selected by Architect from manufacturer's full range

E. Construction:

1. Insulation: 1-inch- (25-mm-) thick, glass-fiber board.

a. R-Value: 4.3 according to ASTM C1363.

2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
3. Hatch Lid: Opaque insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.

4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
   Fabricate curbs to minimum height of 8 inches (203 mm) above roofing surface unless otherwise indicated.
5. Sloping Roofs: Equip hatch with water diverter or cricket on side that obstructs water flow.

F. Hardware: Spring operators, hold-open arm, galvanized steel spring latch with turn handles, galvanized steel butt- or pintle-type hinge system, and padlock hasps inside and outside.

G. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches (1060 mm)
3. Material: Steel tube
4. Post: 1-5/8-inch- (41-mm) diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat

   a. Color: As indicated by manufacturer's designations.

2.4 PIPE AND DUCT SUPPORTS

A. Provide roof pipe and duct supports not otherwise specified in specifications sections in Divisions 22, 23 and 26.

B. Fixed-Height Cradle-Type Pipe Supports: Polycarbonate pipe stand accommodating up to 1-1/2-inch- (38-mm-) diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

C. Fixed-Height Roller-Bearing Pipe Supports: Polycarbonate pipe stand with polycarbonate roller carrying assembly accommodating up to 7-inch- (178-mm-) diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

D. Adjustable-Height Roller-Bearing Pipe Supports: Polycarbonate pipe stand base, pipe support, and roller housing, with stainless steel threaded rod designed for adjusting support height, accommodating up to 18 inch (457 mm) diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

E. Curb-Mounted Pipe Supports: Galvanized steel support with welded or mechanically fastened and sealed corner joints, straight sides or stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom; with adjustable-height roller-bearing pipe support accommodating up to 20-inch- (508-mm-) diameter pipe or conduit and with provision for pipe retainer; as required for quantity of pipe runs and sizes.

F. Duct Supports: Extruded-aluminum, urethane-insulated supports, 2 inches (50 mm) dimension in diameter; with manufacturer's recommended hardware for mounting to structure or structural roof deck.

2.5 PIPE PORTALS

A. Curb-Mounted Pipe Portal: Insulated roof-curb units with welded or mechanically fastened and sealed corner joints, straight sides, or stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom; with weathertight curb cover with single or multiple collared openings and pressure-sealed conically shaped EPDM protective rubber caps sized for piping indicated, with stainless steel snaplock swivel clamps.

B. Flashing Pipe Portal: Formed aluminum membrane-mounting flashing flange and sleeve with collared opening and pressure-sealed conically shaped EPDM protective rubber cap sized for piping indicated, with stainless steel snaplock swivel clamps.

2.6 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 (Z275) coating designation.

1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
3. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

    a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.

4. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils (0.05 mm).
5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Aluminum Sheet: ASTM B209 (ASTM B209M), manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

C. Aluminum Extrusions and Tubes: ASTM B221 (ASTM B221M), manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

D. Stainless Steel Sheet and Shapes: ASTM A240/A240M or ASTM A666, Type 304.

E. Steel Shapes: ASTM A36/A36M, hot-dip galvanized according to ASTM A123/A123M unless otherwise indicated.

F. Steel Tube: ASTM A500/A500M, round tube.

G. Galvanized-Steel Tube: ASTM A500/A500M, round tube, hot-dip galvanized according to ASTM A123/A123M.

H. Steel Pipe: ASTM A53/A53M, galvanized.

2.7 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Glass-Fiber Board Insulation: ASTM C726, nominal density of 3 lb/cu. ft. (48 kg/cu. m), thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F (29.8 K x m/W at 24 deg C), thickness as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Underlayment:

1. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D4397.

F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C920, elastomeric polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

I. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

J. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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 the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof Curb Installation: Install each roof curb so top surface is level.

D. Roof-Hatch Installation:

1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
2. Attach safety railing system to roof-hatch curb.
3. Attach ladder-assist post according to manufacturer's written instructions.

E. Pipe Support Installation: Comply with MSS SP-58 and MSS SP-89. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.

1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

F. Flashing-Pipe Portal Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane according to roof membrane manufacturer's instructions.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A780/A780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

SECTION 07 81 00 - APPLIED FIREPROOFING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section includes sprayed fire-resistive materials (SFRM).

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For paints and coatings, indicating VOC content.
2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Framing plans, schedules, or both, indicating the following:

1. Extent of fireproofing for each construction and fire-resistance rating.
2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
4. Treatment of fireproofing after application.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Product Certificates: For each type of fireproofing.

C. Evaluation Reports: For fireproofing, from ICC-ES.

D. Preconstruction Test Reports: For fireproofing.

E. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on fireproofing.

1. Provide test specimens and assemblies representative of proposed materials and construction.

B. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.

1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
2. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

D. VOC Content: For field applications, coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Primers, Sealers, and Undercoaters: 100 g/L.

E. Low-Emitting Materials: Fireproofing used within the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

A. Sprayed Fire-Resistive Material: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.

1. Products: Subject to compliance with requirements, provide GCP Applied Technologies, Monokote Z-106/HY” or subject to compliance with requirements, provide a comparable product from one of the following manufacturers:

a. Isolatek International Corp.
b. Carboline Co.

2. Bond Strength: Minimum 2000-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.
3. Density: Not less than 22 lb/cu. ft. and as specified in the approved fire-resistance design, according to ASTM E 605.
4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch.
5. Combustion Characteristics: ASTM E 136.
6. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

    a. Flame-Spread Index: 10 or less.
    b. Smoke-Developed Index: 10 or less.

7. Compressive Strength: Minimum 100 lbf/sq. in. according to ASTM E 761.
8. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
9. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
11. Air Erosion: Maximum weight loss of 0.000 g/sq. ft in 24 hours according to ASTM E 859.
12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21.
13. Finish: Spray-textured finish.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:

1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.

C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.

D. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.

E. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.

F. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:

1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.

B. Verify that concrete work on steel deck has been completed before beginning fireproofing work.

C. Verify that roof construction, installation of roof-top HVAC equipment, and other related work is complete before beginning fireproofing work.

D. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.

B. Clean substrates of substances that could impair bond of fireproofing.

C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.

B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.

1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.

D. Metal Decks:

1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, has been completed.
2. Do not apply fireproofing to underside of metal roof deck until roofing has been completed; prohibit roof traffic during application and drying of fireproofing.

E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written recommendations for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

F. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.

G. Extend fireproofing in full thickness over entire area of each substrate to be protected.

H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.

I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.

J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.

K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.

L. Cure fireproofing according to fireproofing manufacturer's written recommendations.

M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

N. Finishes: Where indicated, apply fireproofing to produce the following finishes:

1. Spray-Textured Finish: Finish left as spray applied with no further treatment.
2. Skip-Troweled Finish: Even leveled surface produced by troweling spray-applied finish to smooth out the texture and neaten edges.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Test and inspect as required by the California Building Code.

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fireproofing will be considered defective if it does not pass tests and inspections.

1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.

C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.

D. Repair fireproofing damaged by other work before concealing it with other construction.

E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 07 81 00

SECTION 07 81 23 - INTUMESCENT FIRE PROTECTION

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Mastic and intumescent fire-resistive coatings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Mastic and intumescent fire-resistive coatings.
2. Substrate primers.
3. Reinforcing fabric.
4. Reinforcing mesh.
5. Topcoat.

B. Shop Drawings: Framing plans or schedules, or both, indicating the following:

1. Extent of fire protection for each construction and fire-resistance rating.
2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
3. Minimum mastic and intumescent fire-resistive coating thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
4. Treatment of mastic and intumescent fire-resistive coating after application.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions in size.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of mastic and intumescent fire-resistive coating.

C. Evaluation Reports: For mastic and intumescent fire-resistive coating, from ICC-ES.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by mastic and intumescent fire-resistive coating manufacturer as experienced and with sufficient trained staff to install manufacturer's products in accordance with specified requirements.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of each type of fire protection and different substrate and each required finish as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not apply fire protection when ambient or substrate temperature is 50 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of fire protection, providing complete air exchanges in accordance with manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fire protection dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Assemblies: Provide fire protection, including auxiliary materials, in accordance with requirements of each fire-resistance design and manufacturer's written instructions.

B. Source Limitations: Obtain fire protection for each fire-resistance design from single source.

C. Fire-Resistance Design: Indicated on Drawings, tested in accordance with ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Steel members are to be considered unrestrained unless specifically noted otherwise.

D. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

A. Mastic and Intumescent Fire-Resistive Coating: UL Designation as indicated, Manufacturer's standard, factory-mixed formulation or factory-mixed, multicomponent system consisting of intumescent base coat and topcoat, and complying with indicated fire-resistance design.

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. Carboline Company; a subsidiary of RPM International.
b. Hilti, Inc.
c. Isolatek International.

2. Thickness: As required for fire-resistance design indicated, measured in accordance with requirements of fire-resistance design.
3. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 50 or less.

4. Finish: As selected by Architect from manufacturer's standard finishes.

a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.3 AUXILIARY MATERIALS

A. Provide auxiliary materials that are compatible with mastic and intumescent fire-resistive coating and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: Primers approved by mastic and intumescent fire-resistive coating manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by mastic and intumescent fire-resistive coating manufacturer.

D. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by mastic and intumescent fire-resistive coating manufacturer. Include pins and attachment.

E. Topcoat: Suitable for application over mastic and intumescent fire-resistive coating; of type recommended in writing by mastic and intumescent fire-resistive coating manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and in accordance with each fire-resistance design.

1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fire protection with substrates under conditions of normal use or fire exposure.
2. Verify that objects penetrating fire protection, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
3. Verify that substrates receiving fire protection are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fire protection application.

B. Conduct tests in accordance with mastic and intumescent fire-resistive coating manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire protection materials during application.

B. Clean substrates of substances that could impair bond of fire protection.

C. Prime substrates where included in fire-resistance design and where recommended in writing by mastic and intumescent fire-resistive coating manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fire protection.

D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fire protection. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

A. Construct fire protection assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fire protection Work.

B. Comply with mastic and intumescent fire-resistive coating manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fire protection; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

C. Coordinate application of fire protection with other construction to minimize need to cut or remove fire protection.

1. Do not begin applying fire protection until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
2. Defer installing ducts, piping, and other items that would interfere with applying fire protection until application of fire protection is completed.

D. Install auxiliary materials as required, as detailed, and in accordance with fire-resistance design and mastic and intumescent fire-resistive coating manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by mastic and intumescent fire-resistive coating manufacturer.

E. Spray apply fire protection to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by mastic and intumescent fire-resistive coating manufacturer.

F. Extend fire protection in full thickness over entire area of each substrate to be protected.

G. Install body of fire protection in a single course unless otherwise recommended in writing by mastic and intumescent fire-resistive coating manufacturer.

H. Provide a uniform finish complying with description indicated for each type of fire protection material and matching finish approved for required mockups.

I. Cure fire protection in accordance with mastic and intumescent fire-resistive coating manufacturer's written instructions.

J. Do not install enclosing or concealing construction until after fire protection has been applied, inspected, and tested and corrections have been made to deficient applications.

K. Finishes: Where indicated, apply fire protection to produce the following finishes:

1. Manufacturer's Standard Finishes: Finish in accordance with manufacturer's written instructions for each finish selected.
2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Test and inspect as required by the IBC, Subsection 17 05 .14, "Mastic and Intumescent Fire-Resistant Coatings."

B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fire protection for the next area until test results for previously completed applications of fire protection show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

C. Fire protection will be considered defective if it does not pass tests and inspections.

1. Remove and replace fire protection that does not pass tests and inspections, and retest.
2. Apply additional fire protection, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

D. Prepare test and inspection reports.

3.5 CLEANING

A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.

3.6 PROTECTION

A. Protect fire protection, in accordance with advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fire protection is without damage or deterioration at time of Substantial Completion.

3.7 REPAIRS

A. As installation of other construction proceeds, inspect fire protection and repair damaged areas and fire protection removed due to work of other trades.

B. Repair fire protection damaged by other work before concealing it with other construction.

C. Repair fire protection by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 07 81 23

SECTION 07 84 13 - PENETRATION FIRESTOPPING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. This Section includes penetrating firestopping for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:

1. Walls and partitions.

1.3 PERFORMANCE REQUIREMENTS

A. General: For the following constructions, provide penetrating 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 penetrating 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 penetrating 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 penetrating 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 through-penetration firestop systems.
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 through-penetration firestop systems not requiring removal of insulation.

E. For penetrating 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 ACTION SUBMITTALS

A. Product Data: For each type of penetrating firestopping product indicated.

B. Shop Drawings: For each penetrating 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 penetrating 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 penetrating firestopping condition, submit illustration, with modifications marked, approved by penetrating firestopping m manufacturer's fire-protection engineer.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Product Certificates: Signed by manufacturers of penetrating firestopping products certifying that products furnished comply with requirements.

C. Product Test Reports: From a qualified testing agency indicating penetrating firestopping complies with requirements, based on comprehensive testing of current products.

1.6 CLOSEOUT SUBMITTALS

A. Closeout Records: Signed by installer, provide a detailed listing of actual systems with UL designations and location of each penetrating firestopping product installed.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who specializes in the installation of firestop products and has completed penetrating firestopping similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations: Obtain penetrating firestopping, for each kind of penetration and construction condition indicated, from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide penetrating 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 firestopping systems acceptable to authorities having jurisdiction.
2. Penetrating firestopping are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:.

    a. Penetrating firestopping products bear classification marking of qualified testing and inspecting agency.
    b. Penetrating firestopping correspond to those indicated by reference to penetrating 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 Section "Project Meetings."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver penetrating 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 penetrating firestopping to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetrating firestopping when ambient or substrate temperatures are outside limits permitted by penetrating firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.10 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetrating firestopping are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetrating firestopping.

C. Notify Owner's inspecting agency at least seven days in advance of penetrating firestopping installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up penetrating 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. Products: Subject to compliance with requirements, provide products by one of the following:

1. 3M.
2. Hilti Construction Chemicals, Inc.

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide penetrating firestopping that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating firestopping, under conditions of service and application, as demonstrated by penetrating firestopping manufacturer based on testing and field experience.

B. Accessories: Provide components for each penetrating firestopping that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by penetrating firestopping manufacturer and approved by the qualified testing and inspecting agency for firestopping 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.
d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. General: Provide penetrating firestopping containing the types of fill materials by the UL design. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

C. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

I. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
2. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetrating 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 penetrating firestopping to comply with written recommendations of firestopping 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 penetrating firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetrating 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 penetrating 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 penetrating 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 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install penetrating firestopping to comply with "Performance Requirements" Article and firestopping 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 firestopping 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 penetrating firestopping and to prepare test reports.

1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.

B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.

C. Where deficiencies are found, repair or replace penetrating firestopping so they comply with requirements.

3.5 IDENTIFICATION

A. Identify penetrating firestopping with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each penetrating firestopping installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning--Penetrating Firestopping --Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Penetrating firestopping designation of applicable testing and inspecting agency.
4. Date of installation.

5. Penetrating firestopping manufacturer's name.
6. Installer's name.

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 penetrating 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 penetrating 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 penetrating firestopping immediately and install new materials to produce penetrating firestopping complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE (Attached)

END OF SECTION 07 84 13

PENETRATION FIRESTOPPING SCHEDULE

THIS SCHEDULE INDICATES WHICH SERIES OF UL CLASSIFIED PENETRATIING FIRESTOPPING ASSEMBLIES ARE ACCEPTABLE FOR THIS PROJECT BASED ON BARRIER TYPE, BARRIER CONSTRUCTION AND PENETRANT TYPE.

EACH SYSTEM WITHIN A GIVEN SERIES IS CLASSIFIED FOR SPECIFIC PENETRATION CONDITIONS. CONTRACTOR SHALL SELECT TPFS ASSEMBLIES THAT ARE CLASSIFIED FOR USE WITH EACH PENETRATION'S CONDITION BASED ON CRITERIA SUCH AS THE FOLLOWING: PENETRATION SIZE, PENETRATION SHAPE, PENETRANT SIZE(S), PENETRANT MATERIAL(S), PENETRANT QUANTITY, LOCATIONS(S) OF PENETRANT(S) WITHIN PENETRATION.

BARRIER			PENETRANT TYPE										
TYPE	**BASIS OF CONSTRUCTION**	**FIRE STOPPING REQUIREMENTS**	**NO PENETRANTS**	**METALLIC, UNINSULATED PIPE, CONDUIT, OR TUBING (EXAMPLES: COPPER, IRON, STEEL)**	**NONMETALLIC, UNINSULATED PIPE, CONDUIT, OR TUBING (EXAMPLES: PVC, CPVC, GLASS)**	**ELECTRICAL CABLES**	**CABLE TRAYS W/ELECTRICAL CABLES**	**INSULATED PIPES (EXAMPLES: COPPER, GLASS, IRON, PLASTIC, STEEL) IN SYSTEMS OPERATING BETWEEN 32 DEGF (0 DEGC) AND 122 DEGF (50 DEGC) (NOTE 1)**	**INSULATED PIPES (EXAMPLES: COPPER, GLASS, IRON, PLASTIC, STEEL) IN SYSTEMS OPERATING BETWEEN 32 DEGF (0 DEGC) OR ABOVE 122 DEGF (50 DEGC) (NOTE 2)**	**MISC ELECTRICAL PENETRATIONS (EXAMPLES: BUS DUCTS)**	**METAL DUCT**	**UL LISTED ELECTRICAL BOXES**	**OTHER RECESSED DEVICES (NOTE 3)**
WALL	**WOOD STUDS & GYPSUM WALLBOARD**	UL CLASSIFIED SYSTEM — SINGLE PENETRANT	W-L-000 SERIES OR NOTE 4	W-L-1000 SERIES	W-L-2000 SERIES	W-L-3000 SERIES	W-L-4000 SERIES	W-L-5000 SERIES	W-L-5000 SERIES	W-L-6000 SERIES	W-L-7000 SERIES	CLIV OR NOTE 8	NOTE 8
		UL CLASSIFIED SYSTEM — MULTIPLE PENETRANTS		W-L-8000 SERIES NOTE 5				W-L-8000 SERIES NOTE 5	W-L-8000 SERIES NOTE 5	N/A	N/A	N/A	
UL DESIGN NO. - U300 SERIE		F RATING	EQUAL TO BARRIER RATING										
		T RATING	EQUAL TO F RATING (NOTE 9)										
		ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE
WALL	**METAL STUDS & GYPSUM WALLBOARD**	UL CLASSIFIED SYSTEM — SINGLE PENETRANT	W-L-0000 SERIES OR NOTE 4	W-L-1000 SERIES	W-L-2000 SERIES	W-L-3000 SERIES	W-L-4000 SERIES	W-L-5000 SERIES	W-L-5000 SERIES	W-L-6000 SERIES	W-L-7000 SERIES	CLIV OR NOTE 8	NOTE 8
		UL CLASSIFIED SYSTEM — MULTIPLE PENETRANTS		W-L-8000 SERIES NOTE 5				W-L-8000 SERIES NOTE 5	W-L-8000 SERIES NOTE 5	N/A	N/A	N/A	
UL DESIGN NO. - U400 SERIE		F RATING	EQUAL TO BARRIER RATING										
		T RATING	EQUAL TO F RATING (NOTE 9)										
		ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE
WALL	**POURED CONCRETE, CONCRETE BLOCK OR MASONRY**	UL CLASSIFIED SYSTEM — SINGLE PENETRANT	W-J-0000 SERIES OR NOTE 4	C-AJ-1000 OR W-J-1000 SERIES - NOTE 10	C-AJ-2000 OR W-J-2000 SERIES - NOTE 10	C-AJ-3000 OR W-J-3000 SERIES - NOTE 10	C-AJ-4000 OR W-J-4000 SERIES - NOTE 10	C-AJ-5000 OR W-J-5000 SERIES - NOTE 10	C-AJ-5000 OR W-J-5000 SERIES - NOTE 10	C-AJ-6000 SERIES - NOTE 10	C-AJ-7000 OR W-J-7000 SERIES - NOTE	??	NOTE 8
		UL CLASSIFIED SYSTEM — MULTIPLE PENETRANTS		C-AJ-8000 OR W-J-8000 SERIES -- NOTE 5				C-AJ-8000 OR W-J-8000 SERIES - NOTE 5	C-AJ-8000 OR W-J-8000 SERIES - NOTE 5		N/A	N/A	
UL DESIGN NO. FOR CONCRETE BLOCK WALL - U900 SERIES (ANY THICKNESS)		F RATING	EQUAL TO BARRIER RATING										
		T RATING	EQUAL TO F RATING (NOTE 9)										
		ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE
WALL	**POURED CONRETE BLOCK OR MASONRY**	UL CLASSIFIED SYSTEM — SINGLE PENETRANT	NOTE 4	C-BK-1000 OR W-K-1000 SERIES	N/A	N/A	W-K-4000 SERIES	N/A	N/A	N/A	N/A	N/A	NOTE 8
		UL CLASSIFIED SYSTEM — MULTIPLE PENETRANTS		N/A									
UL DESIGN NO. FOR CONCRETE BLOCK WALL - U900 SERIES MINIMUM THICKNESS GREATER THAN EIGHT INCHES		F RATING	EQUAL TO BARRIER RATING										
		T RATING	EQUAL TO F RATING (NOTE 9)										
		ADDITIONAL REQUIREMENTS	NONE										
FLOOR	**FRAMED**	UL CLASSIFIED SYSTEM — SINGLE PENETRANT	NOTE 4	F-C-1000 SERIES	F-C-2000 SERIES	F-C-3000 SERIES	N/A	F-C-5000 SERIES	F-C-5000 SERIES	N/A	F-C-7000 SERIES	??	NOTE 8
		UL CLASSIFIED SYSTEM — MULTIPLE PENETRANTS		F-C-8000 SERIES NOTE 5				F-C-8000 SERIES NOTE 5	F-C-8000 SERIES NOTE 5		N/A	N/A	
		F RATING	EQUAL TO BARRIER RATING										
		T RATING	EQUAL TO F RATING (NOTE 9)										
		ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE

FLOOR **POURED CONCRETE** MAXIMUM THICKNESS OF FIVE INCHES OR LESS	UL CLASSIFIED SYSTEM	SINGLE PENETRANT	C-AJ-0000 SERIES, F-A-0000 SERIES OR NOTE 4	C-AJ-1000 OR F-A-1000 SERIES	C-AJ-2000 OR F-A-2000 SERIES	C-AJ-3000 OR F-A-3000 SERIES	C-AJ-4000 OR F-A-4000 SERIES	C-AJ-5000 OR F-A-5000 SERIES	C-AJ-5000 OR F-A-5000 SERIES	C-AJ-6000 SERIES	C-AJ-7000 OR F-A-7000 SERIES	??	NOTE 8
		MULTIPLE PENETRANTS		C-AJ-8000 OR F-A-8000 SERIES -- NOTE 5				C-AJ-8000 OR F-A-8000 SERIES - NOTE 5	C-AJ-8000 OR F-A-8000 SERIES - NOTE 5		N/A	N/A	
	F RATING		EQUAL TO BARRIER RATING										
	T RATING		EQUAL TO F RATING (NOTE 9)										
	ADDITIONAL REQUIREMENTS		NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE
FLOOR **POURED CONCRETE** MINIMUM THICKNESS GREATER THAN FIVE INCHES	UL CLASSIFIED SYSTEM	SINGLE PENETRANT	C-BJ-0000 SERIES OR NOTE 4	C-BJ-1000 OR F-B-1000 SERIES	C-BJ-2000 OR F-B-2000 SERIES	C-BJ-3000 OR F-B-3000 SERIES	C-BJ-4000 OR F-B-4000 SERIES	C-BJ-5000 OR F-B-5000 SERIES	C-AJ-5000 OR F-A-5000 SERIES	C-AJ-6000 SERIES	C-BJ-7000 OR F-B-7000 SERIES	??	NOTE 8
		MULTIPLE PENETRANTS		C-BJ-8000 OR F-B-8000 SERIES -- NOTE 5				C-AJ-8000 OR F-A-8000 SERIES - NOTE 5	C-BJ-8000 OR F-B-8000 SERIES - NOTE 5		N/A	N/A	
	F RATING		EQUAL TO BARRIER RATING										
	T RATING		EQUAL TO F RATING (NOTE 9)										
	ADDITIONAL REQUIREMENTS		NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE

THIS SCHEDULE USES THE IDENTIFICATION SYSTEMS OF UNDERWRITERS LABORATORIES, INC. AS DEFINED IN THEIR "FIRE RESISTANCE DIRECTORY" AND AS USED BY MANUFACTURERS ON THEIR UL CLASSIFIED SYSTEM.

INDICATED RATINGS MAY BE EXCEEDED. "N/A" = NOT APPLICABLE

NOTES

1. EXAMPLES OF SYSTEMS THAT OPERATE BETWEEN 32 DEGF (0DEGC) AND 122 DEGF (50 DEGC):
   - CHILLED WATER SUPPLY & RETURN
   - HEAT PUMP WATER SUPPLY & RETURN
   - DOMESTIC COLD WATER
   - DOMESTIC HOT WATER LESS THAN 122 DEGF (50 DEGC)
   - DOMESTIC HOT WATER RECIRCULATION LESS THAN 122 DEGF (5(
2. EXAMPLES OF SYSTEMS OPERATING BELOW 32 DEGF (0DEGC) OR ABOVE 122 DEGF (50 DEGC):
   - STEAM SUPPLY & RETURN
   - STEAM VENT
   - CONDENSATE PUMP DISCHARGE
   - BOILER BLOW DOWN
   - CRYOGENIC VENT
   - HEATING HOT WATER SUPPLY & RETURN
   - HOT-CHILLDED WATER SUPPLY & RETURN
   - GLYCOL HEATING HOT WATER SUPPLY & RETURN
   - DOMESTIC HOT WATER SUPPLY 140 DEGF (60 DEGC)
   - DOMESTIC HOT WATER RECIRCULATION 140 DEGF (60 DEGC)
3. EXAMPLES OF OTHER RECESSED DEVICES:
   - MEDICAL GAS ZONE VALVES
   - MEDICAL GAS OUTLETS
   - FIRE VALVE CABINETS
   - FIRE HOSE CABINETS
   - UNIT HEATERS
   - FIRE FIGHTERS' PHONE
   - FIRE EXTINGUISHER CABINET
4. SEAL OPENING USING BARRIER'S ORIGINAL CONSTRUCTION.
5. WHERE APPROPRIATE MULTI-PENETRATION CLASSIFICATION IS NOT AVAILABLE; INSTALL PENETRANTS SINGLY, AND PROVIDE SINGLE-PENETRANT SYSTEMS.
6. FOR SYSTEMS THAT OPERATE BELOW 32 DEGF (0DEGC) OR ABOVE 122 DEGF (50 DEGC), COMPLY WITH THE FOLLOWING ADDITIONAL REQUIREMENTS:
   A. PROVIDE TPFS SYSTEM USING INTUMESCENT ELASTOMERIC WRAP STRIP AS ITS FILL, VOID, OR CAVITY MATERIAL.
   B. DO NOT USE SERIES 8000 PENETRATIONS. PROVIDE ONLY SINGLE PENETRATIONS.
7. FOR PENETRATIONS PROTECTED WITH DAMPERS, PROVIDE TPFS SYSTEM APPROVED BY DAMPER MANUFACTURER.
8. WHERE UL CLASSIFIED SYSTEMS ARE NOT AVAILABLE FOR OTHER RECESSED DEVICES, MAINTAIN CONTINUITY OF RATED BARRIER CONSTRUCTION AROUND RECESS.
9. WHERE PENETRANT EXITS PENETRATION ENTIRELY WITHIN THE CAVITY OF A WALL A T-RATING IS NOT REQUIRED.
10. WHERE WALL THICKNESSES ARE LESS THAN 4 1/2 INCHES THICK, SUBMIT UL SYSTEM TO ACCOMMODATE.

SECTION 07 84 43 - JOINT FIRESTOPPING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated construction.
2. Joints at exterior curtain-wall/floor intersections.
3. Joints in smoke barriers.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Joints in or between fire-resistance-rated construction.
2. Joints at exterior curtain-wall/floor intersections.
3. Joints in smoke barriers.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-

resistance-rated assembly developed in accordance with current International Firestop Council (IFC) guidelines.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Listed System Designs: For each joint firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint firestop systems for each type of joint opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

    a. Joint firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with Listed System Designs published by a qualified testing agency.

        1) UL in its online directory "Product iQ."
        2) Intertek Group in its "Directory of Building Products."

B. Rain/Water Resistance: For perimeter fire-barrier system applications, where inclement weather or greater-than-transient water exposure is expected, use products that dry rapidly and cure in the presence of atmospheric moisture sufficient to pass ASTM D6904 early rain-resistance test (24-hour exposure).

2.3 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems must accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

1. Joint firestopping systems that are compatible with one another, with the substrates forming openings, and with penetrating items, if any.
2. Provide products that, upon curing, do not re-emulsify, dissolve, leach, breakdown, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture.
3. Provide firestop products that do not contain ethylene glycol.

B. Intumescent Gypsum Wall Framing Gaskets (Applied to Steel Tracks, Runners, and Studs prior to Framing Installation): Provide products with fire, smoke, and acoustical ratings that allow movement up to 100 percent compression and/or extension in accordance with UL 2079 or ASTM E1966; have an L Rating less than 1 cfm/ft. in accordance with UL 2079; and a minimum Sound Transmission Class (STC) rating of 56 in accordance with ASTM E90 or ASTM C919.

C. For aluminum curtain-wall assemblies with one- or two-piece rectangular mullions provide perimeter fire-barrier system that does not require direct screw attachment to mullions and transoms to support and fasten curtain-wall insulation. System to be tested in accordance with ASTM E2307 for up to 2-hour fire resistance and with ASTM E1233 for wind cycling equivalent to 108 mph wind for 500 cycles.

D. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.

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. 3M Building and Construction.
b. International Fireproof Technology Inc.
c. Hilti.
d. ROCKWOOL.
e. Specified Technologies, Inc.

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

E. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E2307.

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. 3M Building and Construction.
b. Hilti.
c. NUCO Inc.
d. ROCKWOOL.
e. Specified Technologies, Inc.

2. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.

F. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.

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. 3M Building and Construction.
b. International Fireproof Technology Inc.
c. NUCO Inc.
d. Specified Technologies, Inc.

2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.

G. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

1. Verify sealant has a VOC content of 250 g/L or less.

2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and acetaldehyde concentration does not exceed 9 mcg/cu. m.

2.4 ACCESSORIES

A. Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

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 of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing joint firestopping systems, clean joints immediately 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 elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping 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. Apply a suitable bond-breaker to prevent three-sided adhesion in applications where this condition occurs, such as the intersection of a gypsum wall to floor or roof assembly where the joint is backed by a steel ceiling runner or track.

3.3 INSTALLATION

A. General: Install joint firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 ft. from end of wall and at intervals not exceeding 30 ft.

B. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections in accordance with ASTM E2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping 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 joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's online directory "Product iQ" under product Category XHBN or Category XHDG.

B. Where Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Building Products" under product category Firestop Systems.

C. Joint Firestopping Systems: As indicated on drawings.

END OF SECTION 07 84 43

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

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 for the following:

1. Head-of-wall joints.
2. Fire sealant joints at base of walls at floor slabs.
3. Fire rated joints between new fire rated walls and existing construction.

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: 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.

B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, indicated as determined by UL 2079.

1. Load-bearing capabilities as determined by evaluation during the time of test.

C. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

A. Product Data: For each type of product provided. For each fire-resistive joint system, show each kind of construction condition in which joints are installed and relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition.

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.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Fire-resistance 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 fire-resistive joint systems acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:

    a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
    b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

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 of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, 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 assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:

C. Manufacturers: Subject to compliance with requirements, provide fire-resistive joint systems for each application on Drawings by one of the following manufacturers or equal products by another manufacturer.

1. A/D Fire Protection Systems Inc.
2. DAP Inc.
3. Firestop Systems Inc.
4. Hilti, Inc.
5. International Protective Coatings Corp.
6. ISOLATEK International.
7. Nelson Firestop Products.
8. NUCO Industries.
9. RectorSeal Corporation (The).
10. Specified Technologies Inc.
11. 3M Fire Protection Products.
12. Tremco, Inc.
13. United States Gypsum Company.

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. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1. Provide a paintable fire caulk at exposed conditions in a neutral color such as white, off-white, grey, beige and NOT red.

C. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

D. Low-Emitting Materials: Fire-resistive joint system sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. 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 FIRE-RESISTIVE JOINT SYSTEMS

A. UL-classified fire-resistive joint systems refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.

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 of work.

1. 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 or damaging adjoining surfaces.

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 and joint systems have been inspected by Architect and local authorities having jurisdiction.

D. Joints Exposed to View: At Fire-Resistive Joint Systems exposed to view provide a well-crafted well tooled concave joint prepared to receive a painted finish.

1. Do not paint fire caulk until fire resistive joint systems have been inspected by architect, owner’s testing agency and code official.

3.4 FIELD QUALITY CONTROL

A. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.

B. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

3.5 CLEANING AND PROTECTING

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.

END OF SECTION 078446

SECTION 07 92 00 - JOINT SEALANTS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Butyl joint sealants.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2 inch (13 mm) wide joints formed between two 6 inch (152 mm) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Sealant Schedule: Submit schedule of sealant applications listing joint sealants proposed for this Work and materials to which joint sealants are specified to be applied. Obtain Architect’s written approval of this sealant schedule before starting Work of this Section.

1. Joint-Sealant Schedule: Include the following information:

    a. Joint-sealant application, joint location, and designation.
    b. Joint-sealant manufacturer and product name.
    c. Joint-sealant formulation.
    d. Joint-sealant color.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

B. Stain-Test-Response Characteristics: Where 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 Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

2.2 SILICONE JOINT SEALANTS

A. Neutral-Curing Silicone Joint Sealant: ASTM C 920.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Corning Corporation; Dow 795
    b. Momentive Performance Materials; SilPruf NB SCS9000.
    c. Pecora Corporation; 895.

2. Type: Single component (S).
3. Grade Nonsag (NS).
4. Class: 50.

B. Mildew-Resistant, Neutral-Curing Silicone Sealant:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Corning Corporation; 786 Mildew Resistant.
    b. Pecora Corporation; 898
    c. Tremco, Tremsil 600.

2. Type: Single-component (S)
3. Grade: Nonsag (NS)
4. Class: 25.

2.3 URETHANE JOINT SEALANTS

A. Urethane Joint Sealant: ASTM C 920.

1. Product: Subject to compliance with requirements, provide the following:

    a. Sika Corporation; Sikaflex 2c NS EZ Mix.
    b. Tremco Incorporated; Vulkem 227
    c. W.R. Meadows; Pourthane NS.

2. Type: Multicomponent (M).
3. Grade: Nonsag (NS).
4. Class: 25.

2.4 IMMERSIBLE JOINT SEALANTS

A. Urethane, Immersible: Immersible, single-component, high-performance, swellable polyurethane based waterstop joint sealant.

1. Products: Subject to compliance with requirements, provide the following:

    a. Sika Corporation; SikaSwell S-2

2. Type: Single-component (S).
3. Grade: Nonsag.
4. Locations: Joints between tilt panels.

2.5 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

1. Product: Subject to compliance with requirements, provide products by one of the following:

    a. Tremco Inc.; Tremco Butyl Sealant.
    b. Everkem Diversified Products, Inc.; Rubber Guard NS.
    c. Pecora Corporation; BC-158.

2.6 LATEX JOINT SEALANTS.

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Product: Subject to compliance with requirements, provide one of the following:

a. Pecora Corporation; AC-20+.
b. Master Builders Solutions by BASF; MasterSeal NP 520.
c. Tremco Incorporated; Tremflex 834.

2.7 ACOUSTICAL JOINT SEALANTS

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:

1. 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.
2. Products:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

2.8 JOINT SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.9 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.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

1. Remove laitance and form-release agents from concrete.
2. Clean nonporous joint substrate 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 by joint-sealant manufacturer or as indicated by 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 or primer 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.

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated 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 in subparagraphs 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 profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

G. 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.

END OF SECTION 07 92 00

SECTION 07 95 13.13 - INTERIOR EXPANSION JOINT COVER ASSEMBLIES

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section includes interior expansion joint cover assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.

B. Shop Drawings: For each expansion joint cover assembly.

1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

C. Samples: For each expansion joint cover assembly and for each color and texture specified, full width by 6 inches (150 mm) long in size.

D. Samples for Initial Selection: For each type of exposed finish.

1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric-seal material.

E. Samples for Verification: For each type of expansion joint cover assembly, full width by 6 inches (150 mm) long in size.

F. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

1. Manufacturer and model number for each expansion joint cover assembly.
2. Expansion joint cover assembly location cross-referenced to Drawings.

3. Nominal, minimum, and maximum joint width.
4. Movement direction.
5. Materials, colors, and finishes.
6. Product options.
7. Fire-resistance ratings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire-resistance-rated expansion joint cover assembly, for tests performed by manufacturer and witnessed by a qualified testing agency or performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of typical expansion joint cover assembly as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Furnish units in longest practicable lengths to minimize field splicing.

B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Expansion joint cover assemblies to withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance according to UL 2079 or ASTM E1966 by a qualified testing agency.

1. Hose Stream Test: Wall-to-wall and wall-to-ceiling assemblies to be subjected to hose stream testing.

2. Seismic Movement:

    a. Joint Movement: As indicated on Drawings.

2.3 FLOOR EXPANSION JOINT COVERS

A. Metal-Plate Floor Joint Cover: Metal cover plate fixed on one side of joint gap and free to slide on other.
   1. Application: Floor to floor, floor to wall.
   2. Installation: Surface mounted.
   3. Load Capacity:

      a. Uniform Load: 50 lb/sq. ft. (244 kg/sq. m)
      b. Concentrated Load: 300 lb (136 kg)
      c. Maximum Deflection: 0.0625 inch (1.6 mm)

   4. Fire-Resistance Rating: Not less than [hat indicated on Drawings where indicated on drawings.
   5. Cover-Plate Design: Serrated edges
   6. Exposed Metal:

      a. Aluminum: Clear anodic, Class I or Clear anodic, Class II as is the Manufacturer's standard.

2.4 WALL EXPANSION JOINT COVERS

A. Elastomeric-Seal Wall Joint Cover: Assembly consisting of elastomeric seal anchored to frames fixed to sides of joint gap.

   1. Application: Wall to wall, 90-degree corner.
   2. Fire-Resistance Rating: Not less than that indicated on Drawings, where indicated on drawings.
   3. Exposed Metal:

      a. Aluminum: Clear anodic, Class I or II as is manufacturer's standard.

   4. Seal: Preformed elastomeric membranes or extrusions.

      a. Color: As selected by Architect from manufacturer's full range.

2.5 CEILING EXPANSION JOINT COVERS

A. Elastomeric-Seal Ceiling Joint Cover: Assembly consisting of elastomeric seal anchored to frames fixed to sides of joint gap.

   1. Application: Wall to ceiling

2. Fire-Resistance Rating: None

a. Aluminum: Clear anodic, Class I or II as is manufacturer's standard.

3. Seal: Preformed elastomeric membranes or extrusions.

a. Color: As selected by Architect from manufacturer's full range

2.6 MATERIALS

A. Aluminum: ASTM B221 (ASTM B221M), Alloy 6063-T5 for extrusions; ASTM B209 (ASTM B209M), Alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to comply with performance criteria for required fire-resistance rating.

2.7 ALUMINUM FINISHES

A. Mill finish.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or AA-M12C22A31, Class II, 0.010 mm or thicker.

2.8 ACCESSORIES

A. Manufacturer's standard attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.

B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.

1. Repair or grout block out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
2. Install frames in continuous contact with adjacent surfaces.
    a. Shimming is not permitted.
3. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
4. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
5. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.

C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

F. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion joint cover assemblies. Reinstall cover plates or seals prior to Substantial Completion.

END OF SECTION 07 95 13.13

SECTION 07 95 13.16 - EXTERIOR EXPANSION JOINT COVER ASSEMBLIES

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior expansion joint covers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for expansion joint cover assemblies.

B. Shop Drawings: For each expansion joint cover assembly.

1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

C. Samples: For each exposed expansion joint cover assembly and for each color and texture specified, full width by 6 inches (150 mm) long in size.

D. Samples for Initial Selection: For each type of exposed finish.

1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.

E. Samples for Verification: For each type of expansion joint cover assembly, full width by 6 inches (150 mm) long in size.

F. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

1. Manufacturer and model number for each expansion joint cover assembly.
2. Expansion joint cover assembly location cross-referenced to Drawings.
3. Nominal, minimum, and maximum joint width.
4. Movement direction.
5. Materials, colors, and finishes.
6. Product options.
7. Fire-resistance ratings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire-resistance-rated expansion joint cover assembly, for tests performed by manufacturer and witnessed by a qualified testing agency or performed by a qualified testing agency.

1.5 MOCKUPS

A. Composite Mockup Panel:

1. Construction of one Composite Mockup Panel after initial selection of exterior expansion joint covers.

    a. Refer to drawings A-AS1.1 for configuration of composite mockup panel which is to include all exterior materials and components included on the drawing of the composite mockup panel.

2. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects against other exterior materials and construction with connection to adjacent materials.
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.

B. In-place Mockups: Build in -place mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup of typical expansion joint cover assembly as shown on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Furnish units in longest practicable lengths to minimize field splicing.

B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance according to UL 2079 or ASTM E1966 by a qualified testing agency.

1. Hose Stream Test: Wall-to-wall and wall-to-soffit assemblies shall be subjected to hose stream testing.

2. Seismic Movement:

    a. Joint Movement: As indicated on Drawings.

2.3 EXTERIOR EXPANSION JOINT COVERS

A. Exterior Elastomeric-Seal Joint Cover: Assembly consisting of elastomeric seal anchored to surface-mounted frames fixed to sides of joint gap.

1. Application: Wall to soffit.
2. Installation: Recessed
3. Fire-Resistance Rating: Not less than that indicated on Drawings, where indicated on drawings.
4. Exposed Metal:

    a. Aluminum: Clear anodic, Class I or II as is manufacturer's standard.

5. Seal: Preformed elastomeric membrane or extrusion.

    a. Color: selected by Architect from manufacturer's full range.

B. Preformed Foam Joint Seals: Manufacturer's standard joint seal manufactured from manufacturer’s standard foam with minimum density of 10 lb/cu. ft. (160 kg/cu. m) and impregnated with a nondrying, water-repellent agent with silicone face. Factory produce in precompressed sizes in roll or stick form to fit joint widths based on design criteria indicated, with factory- or field-applied adhesive for bonding to substrates.

1. Design Criteria:

    a. Nominal Joint Width: As indicated on Drawings.
    b. Fire-Resistance Rating: Not less than indicated on Drawings, where indicated on drawings.
    c. Movement Capability: -50 percent/+50 percent
    d. Application: Wall to wall, floor to floor.
    e. Installation: Flush

2. Joint Seal Color: As selected by Architect from full range of industry colors.

C. Metal Horizontal Traffic Surface Cover:

1. Application: Elevated exterior floor to floor.
2. Installation: Surface mounted.
3. Load Capacity:

    a. Uniform Load: 50 lb/sq. ft. (244 kg/sq. m)
    b. Concentrated Load: 300 lb (136 kg)
    c. Maximum Deflection: 0.0625 inch (1.6 mm)
4. Fire-Resistance Rating: Not less than that indicated on Drawings, where indicated on drawings.
5. Cover-Plate Design: As is consistent with Bases of Design product.
6. Exposed Metal:

    a. Aluminum: Clear anodic, Class I or II as is manufacturer's standard.

D. Expansion Joint Covers Drawing Designations and Basis of Design Products provided by **Construction Specialties:**

1. Refer to **Expansion Joint Cover Schedule** on drawings.

E. Manufacturers: Provide the Basis of Design product or equal product acceptable to the Architect by one of the following manufacturers:

1. Balco Inc.
2. Inpro Architectural Products
3. MM System Corp.

2.4 MATERIALS

A. Aluminum: ASTM B221 (ASTM B221M), Alloy 6063-T5 for extrusions; ASTM B209 (ASTM B209M), Alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304 for plates, sheet, and strips.

C. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.

D. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to comply with performance criteria for required fire-resistance rating.

E. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.

2.5 ALUMINUM FINISHES

A. Mill finish.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or AA-M12C22A31, Class II, 0.010 mm or thicker.

2.6 ACCESSORIES

A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.

1. Provide where indicated on Drawings.

B. Manufacturer's standard attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.

B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.

1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
4. Install frames in continuous contact with adjacent surfaces.

    a. Shimming is not permitted.

5. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.

C. Elastomeric Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Preformed Foam Joint Seals: Install in compliance with manufacturer's written instructions. Install with minimum number of end joints.

1. Install each length of seal immediately after removing protective wrapping.
2. Firmly secure compressed joint seals to joint gap side to obtain full bond using exposed pressure-sensitive adhesive or field-applied adhesive as recommended by manufacturer.
3. Do not pull or stretch material. Produce seal continuity at splices, ends, turns, and intersections of joints.
4. For applications at low ambient temperatures, heat foam joint seal material in compliance with manufacturer's written instructions.

E. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

F. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

G. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

H. Moisture Barrier Drainage: If indicated, provide drainage fitting and connect to drains.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections.

END OF SECTION 07 95 13.16

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard hollow metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

C. Fire-Rated, Borrowed-Light 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, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

E. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. 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. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Fleming Door Products Ltd.; an Assa Abloy Group company.
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 G60 or A60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: 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 hollow metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, 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-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Division 08 Section "Glazing."

J. 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 HOLLOW METAL 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/SDI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

    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 6.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

        1) Locations: Exterior doors and interior doors where indicated.

3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.

    a. Beveled Edge: 1/8 inch in 2 inches.

4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
6. 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/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).
2. Thickness: 1-3/4 inches.

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).
2. Thickness: 1-3/4 inches.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI 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 corners.
2. Fabricate frames as full profile welded unless otherwise indicated.

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.

1. Fabricate frames as full profile welded unless otherwise indicated.
2. Frames for Level 3 Steel Doors: 0.053-inch- thick steel sheet.
3. Frames for Wood Doors: 0.053-inch- thick steel sheet.
4. Frames for Borrowed Lights: 0.053-inch- thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. 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.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. 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.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.7 LOUVERS

A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

D. Weather Stripping: Manufacturer's standard replaceable components.

E. Weather Sweeps and Astragals: Manufacturer's standard exterior-door bottom sweep and astragals with concealed fasteners on mounting strip.

2.9 FABRICATION

A. Fabricate hollow metal work 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. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

D. Hollow Metal 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.
2. Glazed Lites: Factory cut openings in doors.

E. Hollow Metal 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. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Four anchors per jamb from 90 to 120 inches high.
        2) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    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) Five anchors per jamb from 90 to 96 inches high.
        2) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        3) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

    c. Compression Type: Not less than two anchors in each jamb.
    d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

7. Door Silencers: Except on weather-stripped doors and smoke seals, drill stops to receive door silencers as follows. 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.

F. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

G. Hardware Preparation: Factory prepare hollow metal work 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. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

H. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
3. Provide loose stops and moldings on inside of hollow metal work.
4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings 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 the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness 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: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

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 because of 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 plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

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 grout.
5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

6. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame 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. Provide adjustable wedged or bolted anchorage to frame jamb members.
8. Installation Tolerances: Adjust hollow metal 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. Hollow Metal 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. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

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 hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work 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, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

SECTION 08 14 16 - FLUSH WOOD DOORS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately full size door, for each material and finish.
2. Entire door, approximately with door faces and edges representing actual materials to be used.

a. Provide samples for each species of veneer and solid lumber required.
b. Provide samples for each color, texture, and pattern of plastic laminate required.
c. Finish veneer-faced door samples with same materials proposed for factory-finished doors.

3. Louver blade and frame sections, 6 inches long, for each material and finish specified.
4. Frames for light openings, 6 inches long, for each material, type, and finish required.

D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

C. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

E. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

F. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
    b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eggers Industries.
2. Graham; an Assa Abloy Group company.
3. Marshfield Door Systems, Inc.
4. Mohawk Flush Doors, Inc.; a Masonite company.
5. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

C. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1, made with binder containing no urea-formaldehyde resin.
2. Blocking: Provide wood blocking in particleboard-core doors as follows:

    a. 5-inch top-rail blocking, in doors indicated to have closers.
    b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
    c. 5-inch midrail blocking, in doors indicated to have exit devices.

3. Provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

D. 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 fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium (Grade A faces).
2. Species: As indicated.
3. Cut: As indicated.
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
6. Pair and Set Match: Provide for doors hung in same opening.
7. Exposed Vertical and Top Edges: Same species as faces.
8. Core: Particleboard.
9. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
10. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
11. Thickness: 1-3/4 inches.

2.4 LOUVERS AND LIGHT FRAMES

A. Metal Louvers:

1. Blade Type: Vision-proof, inverted V.
2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, with baked-enamel- or powder-coated finish.

    a. Color: As selected by Architect.

B. Louvers for Fire-Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire-protection rating of 1-1/2 hours and less.

1. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, with baked-enamel- or powder-coated finish.

    a. Color: As selected by Architect.

C. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

1. Color: As selected by Architect.

D. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

D. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-4 conversion varnish or TR-6 catalyzed polyurethane.
3. Staining: To match Architect's sample approved by Owner.
4. Effect: Open-grain finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
3. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

F. Verify the flush wood doors matches the furniture provided by Knoll. Replace until woodwork is a match acceptable to Architect.

3.3 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

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Access doors and frames for walls and ceilings.

1.3 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

C. 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: Contractor is responsible for all access panel locations. 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. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

1. ASTM A 123/A 123M, for galvanizing steel and iron products
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

C. Steel Sheet: Uncoated, cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with A60 zinc-iron-alloy (galvannealed) coating or G60 mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.

E. 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.

F. 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 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, according to NFPA 252 or UL 10B.

2.3 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. The Bilco Company.
2. J. L. Industries, Inc.
3. Acudor Products, Inc.
4. Babcock-Davis.
5. Milcor Inc.
6. Nystrom, Inc.

B. Flush Access Doors with Exposed Flanges:

1. Description: Face of door flush with frame, with exposed flange and concealed hinge.
2. Locations: Wall.
3. Door Size: As indicated.
4. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage, factory primed.
5. Stainless Steel Sheet for Door in restrooms: Nominal 0.062 inch, 16 gage, ASTM A480/A480M No. 4 finish.
6. Frame Material: Same material, thickness, and finish as door.
7. Latch and Lock: Prepared for mortise cylinder.

C. Recessed Access Doors with Concealed Flanges:

1. Description: Door face recessed 5/8 inch for gypsum board infill; with concealed flange for gypsum board installation and concealed hinge.

    a. Inlay: 5/8” moisture and mold resistant gypsum board.

2. Location: Ceilings where indicated.
3. Door Size: As indicated.

1. Aluminum Door: 2.8 mm thick extruded aluminum alloy 6063-T6 frame, screwed in place gypsum board inlay complete with galvanized internal steel corner reinforcing. Exposed top edge of frames shall have a concave meniscus rise to 0.5mm thick to accept finishing compound allowing a near invisible flush frame finish.
2. Frame: Recessed aluminum frame shall provide an edge similar to drywall bead against which the ceiling or wall surface shall be finished allowing a near invisible flush frame finish. Fabricate using 2.8mm thick extruded aluminum alloy 6063-T6 frame, complete with galvanized internal steel corner reinforcing. Frame opening complete with perimeter EPDM gasket maintaining the STC of gypsum board assembly.
3. Latch and Lock: Cam latch, hex-head wrench operated.

2.4 FIRE-RATED ACCESS DOORS AND FRAMES

A. Fire-Rated, Flush Access Doors with Exposed Flanges:

1. Description: Door face flush with frame, insulated; with concealed frame with drywall bead, self-closing door, and concealed hinge.

2. Locations: Wall.
3. Door Size: 24 by 24 inch unless indicated otherwise.
4. Fire-Resistance Rating: Not less than 1-1/2 hours, UL "B" label in a 2-hour fire barrier.
5. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage, factory primed.
6. Frame Material: 16-gauge galvanized steel with 1-inch drywall bead which can be taped and mudded for a smooth appearance.
7. Latch and Lock: Self-latching door hardware, Mortise slam lock.

2.5 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. Exposed Flanges: As indicated.
2. For trimless frames with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
3. Provide mounting holes in frames for attachment of units to metal or wood framing.
4. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.

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 cylinder lock, furnish two keys per lock and key all locks alike.
2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

F. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

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

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

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. Procedures for compliance with certain Green Building Initiative's (GBI) "Green Globes for New Construction, may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems.
2. Aluminum-framed entrance door systems.

1.3 ALLOWANCES

A. Door Hardware Preparation and Installation Allowance: Refer to Entrance Door Hardware section under Products.

1.4 REINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
3. Environmental Product Declaration: For each product.
4. Third-Party Certifications: For each product.
5. Third-Party Certified Life Cycle Assessment: For each product.

C. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

    a. Joinery, including concealed welds.
    b. Anchorage.
    c. Expansion provisions.
    d. Glazing.
    e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
4. Include point-to-point wiring diagrams showing the following:

    a. Power requirements for each electrically operated door hardware.
    b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1. Exposed Hardware: Full-size units.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Glazing.

F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. Delegated Design Submittal: For aluminum-framed entrances and storefronts including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.

a. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

B. Test and Evaluation Reports:

1. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by qualified testing agency.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

D. Qualification Statements:

1. For Installer and field testing agency.

E. Delegated design engineer qualifications.

F. Sample warranties.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For aluminum-framed entrances and storefronts.

1.8 QUALITY ASSURANCE

A. Qualifications:

1. Installers: An entity that employs installers and supervisors who are trained and approved by manufacturer.
2. Delegated Design Engineer: A professional engineer who is legally qualified to practice in the State of South Carolina where Project is located and who is experienced in providing engineering services of the type indicated.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. 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.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.9 MOCKUPS

A. Composite Mockup Panel: Mockup panel constructed as part of Byrnes construction shall be left in place for reference for Manning construction.

1. Approval of mockups is for color, texture, 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.

    b. If manufacturers of components other than those installed on the existing mock-up panel are proposed by contractor, re-installation of those components may be required to confirm final finish selection.

B. In-place Mockups: Build in-place mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of each type of typical opening in wall area as follows:
    a. One typical exterior 4 1/2"x2" aluminum storefront bedroom window unit 2'-9" x 8'-3" in an existing window opening.
    b. One typical interior 4 1/2"x2" aluminum storefront window mockup 2'-8" wide x 3'-4" high.
2. Testing shall be performed on exterior mockups in accordance with requirements in "Field Quality Control" Article.
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 mockup of in place full scale exterior window unit may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship 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 created by wind and thermal and structural movements.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    d. Water penetration through fixed glazing and framing areas.
    e. Failure of operating components.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

C. Environmental Product Declaration (EPD): Shall have an Aluminum Extrusions EPD.

D. Structural Loads:

1. Wind Loads:

a. Ultimate design wind speed: 106 mph
b. Nominal design wind speed: 83 mph

2. Seismic Risk Category: II

a. Exposure Category: B

E. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of 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.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
3. Cantilever Deflection: Limited to 2L/175 at unsupported cantilevers.

F. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or 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.

G. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

H. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 EXTERIOR STOREFRONT SYSTEMS (ES)

A. Manufacturer: Subject to compliance with requirements, provide the following:

1. ES1: Kawneer North America, “Trifab VersaGlaze 451/451T Framing System.”
2. ES2: Kawneer North America, “Trifab VersaGlaze 601/601T Framing System.”

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.

3. Glazing Plane:

   a. ES1: Center

   b. ES2: Offset.

4. Profile:

   a. ES1: 2” by 4-1/2”.
   b. ES2: 2” by 6”.

5. ~~Base bid~~ Finish: ***Medium Bronze***
6. ~~Alternate Finish: High-performance organic finish~~

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7. Fabrication Method: Field-fabricated stick system.
8. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
9. Steel Reinforcement: As required by manufacturer.

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

~~E. Insulated Spandrel Panels:~~

~~1. Manufacturer: Subject to compliance with requirements, provide the following:~~

~~a. Mapes Industries, Inc., “Mapes-R Infill Panel.”~~

~~2. Laminated, metal-faced flat panels with no deviations in plane exceeding 0.8 percent of panel dimension in width or length.~~

~~a. Overall Panel Thickness: 1 inch.~~
~~b. Exterior Skin: Aluminum.~~

~~1) Thickness: Manufacturer's standard for finish and texture indicated.~~
~~2) Finish: Match framing system.~~
~~3) Texture: Smooth.~~
~~4) Backing Sheet: 1/8-inch-thick tempered hardboard.~~

~~c. Interior Skin: Aluminum.~~

~~1) Thickness: Manufacturer's standard for finish and texture indicated.~~
~~2) Finish: Matching storefront framing.~~
~~3) Texture: Smooth.~~

~~4) Backing Sheet: 1/2-inch-thick gypsum board with proprietary fire-resistance-rated core.~~

~~d. Thermal Insulation Core: Manufacturer's standard rigid, closed-cell, polyisocyanurate board.~~

~~e. Surface-Burning Characteristics: Comply with ASTM E84; testing 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.~~

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2.4 INTERIOR STOREFRONT SYSTEMS (IS)

A. Manufacturer and Product: Subject to compliance with requirements, provide the following:

1. IS1: Kawneer North America, “Trifab VersaGlaze 451/451T Framing System.”

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Interior Framing Construction: Non-thermal.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Center.
4. Profile: 2” by 4-1/2”.
5. ~~Base Bid~~ Finish: Clear Anodic Finish
~~6. Alternate Finish: High-performance organic finish.~~

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7. Fabrication Method: Field-fabricated stick system.
8. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
9. Steel Reinforcement: As required by manufacturer.

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.5 ENTRANCE DOOR SYSTEMS

A. Manufacturer: Subject to compliance with requirements, provide the following:

1. Interior Kawneer North America, “500 Standard Entrances.”

2. Exterior Kawneer North America, “500 Tuffline Entrances.”

B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Interior Door Construction: 1 3/4-inch overall thickness with manufacturer’s standard thick extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated, and fillet welded or that incorporate concealed tie rods.
2. Exterior Door Construction: 2-inch overall thickness, with minimum 0.188-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated, and fillet welded or that incorporate concealed tie rods.
3. Door Design: Wide stile with mid rail; 5-inch nominal width.
4. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide nonremovable glazing stops on outside of door.

5. Finish: Match adjacent storefront framing finish.

2.6 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware is NOT specified in this Section and is specified in Section 08 71 00 "Door Hardware”, except as indicated below in this section.

B. Door Hardware Preparation and Installation Allowance: Prepare doors to receive hardware and install hardware provided under 08 71 00 Door hardware. Refer to floor plans and key notes on floor plans indicating the following hardware requirements for each door for establishment of allowance.

1. Interior or exterior door.
2. Electronic card reader access control.
3. Panic hardware.
4. Automatic door operators.

C. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

D. Weather Stripping: At exterior doors manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

E. Weather Sweeps: At exterior doors manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

F. Thresholds: At exterior doors BHMA A156.21 raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

2.7 GLAZING

A. Glazing: Comply with Section 08 80 00 "Glazing."

1. Exterior Glazing: 1-inch thick insulated glazing units.
2. Interior Glazing: 3/8-inch thick glazing.

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

1. Verify sealant has a VOC content of 250 g/L or less.
2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and acetaldehyde concentration does not exceed 9 mcg/cu. m.

D. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

2.8 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

F. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

2.9 ACCESSORIES

A. Automatic Door Operators: Section 08 71 13 "Power Door Operators."

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

C. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

E. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

F. Rigid PVC filler.

2.10 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. 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. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior.

6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At interior and exterior doors, provide compression weather stripping at fixed stops.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.11 ALUMINUM FINISHES

A. Interior Selected Finish: Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

B. Exterior Selected Finish: High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color and Gloss: As selected by Architect from manufacturer's full standard 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 the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, as specified in Section 07 92 00 "Joint Sealants," to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 08 80 00 "Glazing."

3.4 INSTALLATION OF WEATHERSEAL SEALANT

A. After structural sealant has completely cured, remove temporary retainers and insert backer rod between lites of glass as recommended by sealant manufacturer.

B. Install weatherseal sealant to completely fill cavity, in accordance with sealant manufacturer's written instructions, to produce weatherproof joints.

3.5 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

A. Install entrance doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.

2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.6 ERECTION TOLERANCES

A. Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:

    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.7 FIELD QUALITY CONTROL

A. Tests and Inspections: Perform the following tests on representative areas of aluminum-framed entrances and storefronts.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested in accordance with AAMA 501.2 and shall not evidence water penetration.

    a. Perform a minimum of three tests in areas as directed by Architect.

2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

    a. Perform a minimum of three tests in areas as directed by Architect.

3. Water Penetration: ASTM E1105 at a static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.

B. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 MAINTENANCE SERVICE

A. Entrance Door Hardware Maintenance:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

END OF SECTION 08 41 13

SECTION 08 44 13 - GLAZED ALUMINUM CURTAIN WALLS

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. Procedures for compliance with certain Green Building Initiative's (GBI) "Green Globes for New Construction, may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Glazed aluminum curtain wall systems:

a. Conventionally glazed.

B. Related Requirements:

1. Section 088000 "Glazing" for curtain wall glazing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.
3. Environmental Product Declaration: For each product.
4. Third-Party Certifications: For each product.
5. Third-Party Certified Life Cycle Assessment: For each product.

C. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

G. Delegated-Design Submittal: For glazed aluminum curtain walls, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.

a. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

B. Source quality-control reports.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and that employs a qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AGM) contractors

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. 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.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 MOCKUPS

A. Composite Mockup Panel: Mockup panel constructed as part of Byrnes construction shall be left in place for reference for Manning construction.

1. Approval of mockups is for color, texture, 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.

b. If manufacturers of components other than those installed on the existing mock-up panel are proposed by contractor, re-installation of those components may be required to confirm final finish selection.

B. In-place Mockups: Build in-place mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup as a part of composite wall panel mockup. Curtain wall component to be 8’-0” high x 2’-8” wide with an intermediate horizontal frame.
2. Testing shall be performed on mockups in accordance with requirements in "Field Quality Control" Article.
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.

1.9 WARRANTY

A. Special Assembly Warranty: Manufacturer agrees to repair or replace components of glazed aluminum curtain wall that do not comply with requirements or that fail in materials or workmanship 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 created by wind and thermal and structural movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion

B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure, including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.

e. Failure of operating units.

B. Structural Loads:

1. Wind Loads:

a. Ultimate design wind speed: 106 mph
b. Nominal design wind speed: 83 mph

2. Seismic Risk Category: II

a. Exposure Category: B

C. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans of greater than 13 feet 6 inches (4.1 m).
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch (3.2 mm).
3. Cantilever Deflection: Limited to 2l/175 at unsupported cantilevers.

D. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or 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. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).
2. Maximum Water Leakage: In accordance with AAMA 501.1. Water leakage does not include water controlled by flashing and gutters or water that is drained to exterior.

F. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).

1. Maximum Water Leakage: According to AAMA 501.1. No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.

G. Interstory Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement: L/400 under wind loads.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested in accordance with AAMA 501.4 at design displacement.

H. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested in accordance with AAMA 501.6 at design displacement[and 1.5 times the design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested in accordance with AAMA 501.7 at design displacement and 1.5 times the design displacement.

I. Energy Performance: Certified and labelled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):

a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.42 Btu/sq. ft. x h x deg F (1.82 W/sq. m x K) as determined in accordance with NFRC 100.

2. Solar Heat Gain Coefficient (SHGC):

a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.29 as determined in accordance with NFRC 200.

3. Air Leakage:

a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa) when tested in accordance with ASTM E283.

4. Condensation Resistance Factor (CRF):

a. Fixed Glazing and Framing Areas: CRF for the system of not less than 68 as determined in accordance with AAMA 1503.

J. Noise Reduction: Test in accordance with ASTM E90, with ratings determined by ASTM E1332, as follows:

1. Outdoor-Indoor Transmission Class: Minimum 30.
2. Sound Transmission Class: Minimum 34.

K. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 GLAZED ALUMINUM CURTAIN WALL SYSTEMS

A. Manufacturer and Product: Subject to compliance with requirements, provide the following:

1. CW: Kawneer North America, 1600-1, captured, 2 1/4" x 7 1/2"

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. ~~Base Bid~~ Finish: Medium Bronze.
5. ~~Alternate Finish: High-performance organic finish.~~

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6. System: Either stick or unitized system.
7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
8. Steel Reinforcement: As required by manufacturer.

C. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.

1. Include snap-on aluminum trim that conceals fasteners.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

E. Break Metal Glazed into Gaskets:

1. Break metal finished on exterior side.

a. Material:

1) Thickness: Manufacturer's standard for finish and texture indicated
2) Finish: Match framing system
3) Texture: Smooth

F. Entrance Door Systems: Comply with Section 084113 "Aluminum-Framed Entrances and Storefronts"

2.3 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Glazing Gaskets: ASTM C509 or ASTM C864. Manufacturer's standard compression-type, replaceable EPDM.

1. Color: Black

2.4 MATERIALS

A. Sheet and Plate: ASTM B209 (ASTM B209M).

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

F. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.

2.5 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials

D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.6 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. 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. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Fabricate components to resist water penetration as follows:

1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.

E. Curtain-Wall Framing: Fabricate components for assembly using manufacturer's standard assembly method.

F. Factory-Assembled Frame Units:

1. Rigidly secure nonmovement joints.
2. Seal joints watertight unless otherwise indicated.
3. Install glazing to comply with requirements in Section 088000 "Glazing."

G. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.7 ALUMINUM FINISHES

A. Selected Finish: High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.

1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color and Gloss: As selected by Architect from manufacturer's full standard 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 the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Where welding is required, weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.

G. Seal joints watertight unless otherwise indicated.

H. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with primer, applying sealant or tape, or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

I. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 088000 "Glazing."

3.4 ERECTION TOLERANCES

A. Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:

    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
    c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

A. Field Quality-Control Testing: Perform the following test on representative areas of glazed aluminum curtain walls.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested in accordance with AAMA 501.2 and shall not evidence water penetration.

    a. Perform a minimum of three tests in areas as directed by Architect.

2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. (0.45 L/s per sq. m) at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).

    a. Perform a minimum of three tests in areas as directed by Architect.

3. Water Penetration: ASTM E1105 at a minimum uniform and cyclic static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft. (300 Pa), and shall not evidence water penetration.

B. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 08 44 13

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware.

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Attachments:

1. Refer to Electronic Door Hardware Scheduled attached to the end of this specification section.

D. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
   a. "Metal Doors and Frames"
   b. "Flush Wood Doors"
   c. "Stile and Rail Wood Doors"
   d. "Interior Aluminum Doors and Frames"
   e. "Aluminum-Framed Entrances and Storefronts"
   f. "Stainless Steel Doors and Frames"
   g. "Special Function Doors"
   h. "Entrances"
6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies

3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
   a. Wiring Diagrams: For power, signal, and control wiring and including:
      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
   a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:
   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   c. Indicate complete designations of each item required for each opening, include:
      1) Door Index: door number, heading number, and Architect's hardware set number.
      2) Quantity, type, style, function, size, and finish of each hardware item.
      3) Name and manufacturer of each item.
      4) Fastenings and other pertinent information.
      5) Location of each hardware set cross-referenced to indications on Drawings.
      6) Explanation of all abbreviations, symbols, and codes contained in schedule.
      7) Mounting locations for hardware.
      8) Door and frame sizes and materials.
      9) Degree of door swing and handing.
      10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:
   a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
   b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
   f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
   a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
   b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
   a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Final approved hardware schedule edited to reflect conditions as installed.
   d. Final keying schedule
   e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
   f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
   a. Fire door assemblies, in compliance with NFPA 80.
   b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Architect and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.
   d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
   a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.

b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:
   a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
   b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware
   a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:
   a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference
   a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      2) Preliminary key system schematic diagram.
      3) Requirements for key control system.
      4) Requirements for access control.
      5) Address for delivery of keys.

2. Pre-installation Conference
   a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   b. Inspect and discuss preparatory work performed by other trades.
   c. Inspect and discuss electrical roughing-in for electrified door hardware.
   d. Review sequence of operation for each type of electrified door hardware.
   e. Review required testing, inspecting, and certifying procedures.
   f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:
   a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
    a. Mechanical Warranty
        1) Locks
            a) Sargent 8200 Series: 10 years
            b) Best 9k Series: 10 years
        2) Exit Devices
            a) Von Duprin: 3 years
        3) Closers
            a) LCN 4000 Series: 30 years
        4) Automatic Operators
            a) Record: 2 years
    b. Electrical Warranty

1) Locks
   a) Sargent: 2 years
2) Exit Devices
   a) Von Duprin: 1 year

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."

   1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.

B. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

   1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
   2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.

3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Ives 5BB series

2. Acceptable Manufacturers and Products:
   a. McKinney TB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
6. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Select
   b. Pemko

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Von Duprin EPT-10

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. DCI

b. Trimco

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.07 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Sargent 8200 Series

2. Acceptable Manufacturers and Products:
   a. Best 45H series

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Provide motor based electrified locksets that comply with the following requirements:
   a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
   b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
   c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
   d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate "hot levers" in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
   e. Connections – provide quick-connect Molex system standard.

8. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

a. Provide levers that return to within 1/2 inch (13 mm) of door face.
b. Vandlgard: Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.

2.08 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Best 9k Series

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
   a. Provide levers that return to within 1/2 inch (13 mm) of door face.
   b. Vandlgard: Provide levers with vandal resistant technology for use at heavy traffic or abusive applications.

2.09 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Von Duprin 98/35A series

2. Acceptable Manufacturers and Products:
   a. Detex Advantex series
   b. Sargent 19-43-GL-80 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.

6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.
15. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.10 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Existing Best SFIC

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide cylinders/cores to match Owner’s existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer’s series as indicated. Refer to “KEYING” article, herein.

2.11 KEYING

A. Scheduled System:

1. Existing factory registered system:
   a. Coordinate with Owner to provide cylinders keyed as required to match Owner's existing system.

B. Requirements:

1. Construction Keying:
   a. Replaceable Construction Cores.
      1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
         a) 3 construction control keys

b) 12 construction change (day) keys.
2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:
a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
1) Master Keying system as directed by the Owner.
b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
c. Provide keys with the following features:
1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
d. Identification:
1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
2) Identification stamping provisions must be approved by the Architect and Owner.
3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
e. Quantity: Furnish in the following quantities.
1) Change (Day) Keys: 3 per cylinder/core.
2) Permanent Control Keys: 3.
3) Master Keys: 6.

2.12 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer:
a. Telkee

2. Acceptable Manufacturers:
a. No Substitute
b. HPC
c. Lund

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
b. Provide hinged-panel type cabinet for wall mounting.

2.13 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. LCN 4010/4110/4020 series

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter double heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.14 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Elmes
   b. Trimco

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.15 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Trimco

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.16 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
   a. Glynn-Johnson

2. Acceptable Manufacturers:
   a. Rixson
   b. Sargent
   c. ABH

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.17 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Trimco
   b. Burns

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.

2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.18 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Zero International

2. Acceptable Manufacturers:
   a. Reese
   b. Legacy

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.19 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Burns
   b. Rockwood
   c. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.20 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. LCN

2. Acceptable Manufacturers:
   a. Rixson
   b. Sargent

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordinate projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Connect magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

M. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

N. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

O. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

P. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

Q. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

R. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

Hardware Group No. HW-01

For use on Door #(s):
GST2.1 1ST1

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		B643E/716	IVE
1	EA	ELEC PANIC HARDWARE	RX-LC-QEL-98-NL-SNB 24 VDC FURNISHED BY SECURITY INTEGRATOR		313_US10B	VON
1	EA	RIM CYLINDER	1E72		613	BES
1	EA	PERMANENT CORE	BY OWNER		613	BES
1	EA	SURFACE CLOSER	4111 SCUSH TBSRT		695	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		613	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	39D		D	ZER
1	EA	THRESHOLD	655D-223		D	ZER
1	EA	CREDENTIAL READER	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.2. DOOR FUNCTION: DOORS NORMALLY CLOSED AND LOCKED ENTRY BY CREDENTIAL TO CARD READER RETRACTS LATCHBOLT AND ALLOWS FOR ENTRY. FREE EGRESS AT ALL TIMES. KEY OVERRIDE AVAILABLE.3. ALL ELECTRIFIED HARDWARE INCLUDING CREDENTIALS, CARD READER, WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

Hardware Group No. HW-02

For use on Door #(s):
G22

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ELECTRIFIED MORTISE LOCK	NAC 82271-24V IDP LW1L 70 (CONST SFIC) FURNISHED BY SECURITY INTEGRATOR		626	SAR
1	EA	PERMANENT CORE	BY OWNER		626	BES
1	EA	SURFACE CLOSER	4011 TBSRT		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS439		630	IVE
3	EA	SILENCER	SR64/65 AS REQ		GRY	IVE
1	EA	CREDENTIAL READER	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.
2. DOOR FUNCTION: DOORS NORMALLY CLOSED AND LOCKED ENTRY BY CREDENTIAL TO CARD READER UNLOCKS ELECTRIFIED LOCK AND ALLOWS FOR ENTRY. FREE EGRESS AT ALL TIMES. KEY OVERRIDE AVAILABLE.
3. ALL ELECTRIFIED HARDWARE INCLUDING CREDENTIALS, CARD READER, WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

Hardware Group No. HW-03

For use on Door #(s):
R01.2 G22A

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	ELECTRIFIED MORTISE LOCK	NAC 82271-24V IDP LW1L 70 (CONST SFIC) FURNISHED BY SECURITY INTEGRATOR		626	SAR
1	EA	PERMANENT CORE	BY OWNER		626	BES
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS439		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	CREDENTIAL READER	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.
2. DOOR FUNCTION: DOORS NORMALLY CLOSED AND LOCKED ENTRY BY CREDENTIAL TO CARD READER UNLOCKS ELECTRIFIED LOCK AND ALLOWS FOR ENTRY. FREE EGRESS AT ALL TIMES. KEY OVERRIDE AVAILABLE.
3. ALL ELECTRIFIED HARDWARE INCLUDING CREDENTIALS, CARD READER, WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

Hardware Group No. HW-04

For use on Door #(s):
GST2.2

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP			652	IVE
1	EA	ELEC FIRE EXIT HARDWARE	RX-LC-QEL-98-NL-F-SNB 24 VDC FURNISHED BY SECURITY INTEGRATOR			626	VON
1	EA	RIM CYLINDER	1E72			626	BES
1	EA	PERMANENT CORE	BY OWNER			626	BES
1	EA	SURFACE CLOSER	4111 SCUSH TBSRT			689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS			630	IVE
1	EA	GASKETING	488SBK PSA			BK	ZER
1	EA	CREDENTIAL READER	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				
1	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.
2. DOOR FUNCTION: DOORS NORMALLY CLOSED AND LOCKED ENTRY BY CREDENTIAL TO CARD READER RETRACTS LATCHBOLT AND ALLOWS FOR ENTRY. FREE EGRESS AT ALL TIMES. KEY OVERRIDE AVAILABLE.
3. ALL ELECTRIFIED HARDWARE INCLUDING CREDENTIALS, CARD READER, WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

Hardware Group No. HW-05

For use on Door #(s):
1ST2

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP			652	IVE
1	EA	ELEC FIRE EXIT HARDWARE	RX-LC-98-L-F-M996-06-FSE-SNB FURNISHED BY SECURITY INTEGRATOR			626	VON
1	EA	RIM CYLINDER	1E72			626	BES
1	EA	PERMANENT CORE	BY OWNER			626	BES
1	EA	SURFACE CLOSER	4111 SCUSH TBSRT			695	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS			630	IVE
1	EA	GASKETING	488SBK PSA			BK	ZER
1	EA	CREDENTIAL READER	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				
1	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.
2. DOOR FUNCTION: DOORS NORMALLY CLOSED AND LOCKED ENTRY BY CREDENTIAL TO CARD READER UNLOCKS ELECTRIFIED TRIM AND ALLOWS FOR ENTRY. FREE EGRESS AT ALL TIMES. KEY OVERRIDE AVAILABLE.
3. ALL ELECTRIFIED HARDWARE INCLUDING CREDENTIALS, CARD READER, WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

Hardware Group No. HW-06

NOT USED

Hardware Group No. HW-07

For use on Door #(s):

G10A	G43	G44

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	MANUAL FLUSH BOLT	FB458 12"		626	IVE
1	EA	STOREROOM LOCK	9K37D 15D		626	BES
1	EA	PERMANENT CORE	BY OWNER		626	BES
1	EA	SURFACE CLOSER	4111 SCUSH TBSRT		695	LCN
2	EA	FLOOR STOP	FS439		630	IVE
2	EA	SILENCER	SR64/65 AS REQ		GRY	IVE

Hardware Group No. HW-08

For use on Door #(s):

G11	G12	G41	G42	121A	121B
129A	129B				

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PUSH PLATE	8200 4" X 16"		630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"		630	IVE
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	4011 TBSRT		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64/65 AS REQ		GRY	IVE

Hardware Group No. HW-09

For use on Door #(s):
G20 G23 122C 128A

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	9K37D 15D		626	BES
1	EA	PERMANENT CORE	BY OWNER		626	BES
1	EA	SURFACE CLOSER	4011 TBSRT		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS439		630	IVE
3	EA	SILENCER	SR64/65 AS REQ		GRY	IVE

Hardware Group No. HW-10

For use on Door #(s):
116.2 117 G22B

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	9K37D 15D		626	BES
1	EA	PERMANENT CORE	BY OWNER		626	BES
1	EA	SURFACE CLOSER	4011 TBSRT		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS439		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. HW-11

For use on Door #(s):
G30.2

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	9K37D 15D		626	BES
1	EA	PERMANENT CORE	BY OWNER		626	BES
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS439		630	IVE
3	EA	SILENCER	SR64/65 AS REQ		GRY	IVE

Hardware Group No. HW-12

For use on Door #(s):

G52	116.1	R01.1	R01.4

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		B643E/716	IVE
1	EA	STOREROOM LOCK	8204 LW1 L 70 (CONST SFIC)		626	SAR
1	EA	PERMANENT CORE	BY OWNER		613	BES
1	EA	SURFACE CLOSER	4111 SCUSH TBSRT		695	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	39D		D	ZER
1	EA	THRESHOLD	655D-223		D	ZER
1	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			

Hardware Group No. HW-13

For use on Door #(s):
GM1.1

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
8	EA	HINGE	5BB1 4.5 X 4.5 NRP			B643E/716	IVE
1	EA	REMOVABLE MULLION	KR4954 FURNISHED BY SECURITY INTEGRATOR			695	VON
1	EA	ELEC PANIC HARDWARE	LD-RX-LC-98-EO-SNB FURNISHED BY SECURITY INTEGRATOR			313	VON
1	EA	ELEC PANIC HARDWARE	RX-LC-98-NL-SNB FURNISHED BY SECURITY INTEGRATOR			313	VON
1	EA	RIM CYLINDER	1E72			613	BES
1	EA	MORTISE CYLINDER	1E74			613	BES
2	EA	PERMANENT CORE	BY OWNER			613	BES
2	EA	SURFACE CLOSER	4111 SCUSH TBSRT			695	LCN
2	EA	KICK PLATE	8400 8" X 2" LDW B-CS			613	IVE
1	EA	GASKETING	188SBK PSA			BK	ZER
2	EA	DOOR SWEEP	39D			D	ZER
1	EA	THRESHOLD	655D-223			D	ZER
2	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				

Hardware Group No. HW-14

For use on Door #(s):
1M1 XM1 XM1 R01.3

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	FIRE EXIT HARDWARE	98-NL-F-SNB		313_US10B	VON
1	EA	RIM CYLINDER	1E72		613	BES
1	EA	PERMANENT CORE	BY OWNER		626	BES
1	EA	SURFACE CLOSER	4111 SCUSH TBSRT		695	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. HW-15

NOT USED

Hardware Group No. HW-16

For use on Door #(s):
121 129

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PUSH PLATE	8200 4" X 16"		630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"		630	IVE
1	EA	SURFACE CLOSER	4011 TBSRT		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS439		630	IVE
3	EA	SILENCER	SR64/65 AS REQ		GRY	IVE

Hardware Group No. HW-17

For use on Door #(s):
230

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5			652	IVE
1	EA	PRIVACY LOCK WITH DEADBOLT	8266 LW1 L X INDICATOR			626	SAR
1	EA	ELECTRIC STRIKE	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				
1	EA	AUTO OPERATOR	8100 SERIES FURNISHED BY SECURITY INTEGRATOR				REC
2	EA	HAND WAVE ACTUATOR	BEA MS41-D FURNISHED BY SECURITY INTEGRATOR				
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS			630	IVE
1	EA	FLOOR STOP	FS439			630	IVE
1	EA	GASKETING	488SBK PSA			BK	ZER
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.
2. DOOR FUNCTION: DOOR NORMALLY CLOSED AND LATCHED. PRESSING PUSH PAD WILL RELEASE ELECTRIC STRIKE AND OPEN DOOR. DEADBOLT WILL LOCK DOOR AND PREVENT OPERATOR FROM OPENING.
3. ALL ELECTRIFIED HARDWARE AND OPERATORS INCLUDING WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

Hardware Group No. HW-18

For use on Door #(s):

X04.1	X04.1	X04.2	X04.2	X07	X12
X12	X12	X33	X33	X34	

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	9K37R 15D		626	BES
1	EA	SURFACE CLOSER	4011 TBSRT		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS439		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. HW-19

For use on Door #(s):

X16	X16	X25	X25	X31.3	X31.3
XM2	XM2	XM3			

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	9K37D 15D		626	BES
1	EA	PERMANENT CORE	BY OWNER		626	BES
1	EA	SURFACE CLOSER	4111 SCUSH TBSRT		695	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. HW-20

For use on Door #(s):

X30	X30	X32	X32

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK	8265 LW1 L X INDICATOR		626	SAR
1	EA	SURFACE CLOSER	4011 TBSRT		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS439		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. HW-21

For use on Door #(s):

X31.1	X31.1

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM LOCK	9K37R 15D		626	BES
1	EA	PERMANENT CORE	BY OWNER		626	BES
1	EA	SURFACE CLOSER	4111 SCUSH TBSRT		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. HW-22

For use on Door #(s):
X31.2 X31.2

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSROOM LOCK	9K37R 15D		626	BES
1	EA	PERMANENT CORE	BY OWNER		626	BES
1	EA	SURFACE CLOSER	4111 EDA		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	FLOOR STOP	FS439		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. HW-23

For use on Door #(s):
X31A X31A X31B X31B X31C X31C
X31D X31D X31E X31E X31F X31F

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK	8265 LW1 L X INDICATOR		626	SAR
1	EA	FLOOR STOP	FS439		630	IVE
3	EA	SILENCER	SR64/65 AS REQ		GRY	IVE

Hardware Group No. HW-24

For use on Door #(s):
XC1.1 XC1.1 XC1.2 XC1.2

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	9K3L 15D		626	BES
1	EA	SURFACE CLOSER	4011 TBSRT		689	LCN
1	EA	MAGNET	SEM7850 12V/24V/120V	✓	689	LCN
1	EA	GASKETING	488SBK PSA		BK	ZER

Hardware Group No. HW-25

For use on Door #(s):
XST1 XST1

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 5 X 4.5		652	IVE
1	EA	FIRE EXIT HARDWARE	98-L-BE-F-06-SNB		626	VON
1	EA	SURFACE CLOSER	4011 TBSRT		689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS		630	IVE
1	EA	MAGNET	SEM7850 12V/24V/120V	✓	689	LCN
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	THRESHOLD	655A-223		A	ZER

Hardware Group No. HW-26

For use on Door #(s):
XST2 XST2

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	FIRE EXIT HARDWARE	98-L-BE-F-06-SNB	626	VON
1	EA	SURFACE CLOSER	4011 TBSRT	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	THRESHOLD	655A-223	A	ZER

Hardware Group No. HWA-1

NOT USED

Hardware Group No. HWA-2

For use on Door #(s):
G00.1 G00.2 100.1 100.2

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	027XY EPT		710	IVE
2	EA	POWER TRANSFER	EPT10 FURNISHED BY SECURITY INTEGRATOR		695	VON
1	EA	REMOVABLE MULLION	KR4954 FURNISHED BY SECURITY INTEGRATOR		695	VON
1	EA	ELEC PANIC HARDWARE	RX-LC-QEL-98-EO-SNB 24 VDC FURNISHED BY SECURITY INTEGRATOR		313_US10B	VON
1	EA	ELEC PANIC HARDWARE	RX-LC-QEL-98-NL-SNB 24 VDC FURNISHED BY SECURITY INTEGRATOR		313_US10B	VON
1	EA	RIM CYLINDER	1E72 FURNISHED BY SECURITY INTEGRATOR		613	BES
1	EA	MORTISE CYLINDER	1E74 FURNISHED BY SECURITY INTEGRATOR		613	BES
2	EA	PERMANENT CORE	BY OWNER		613	BES
1	EA	AUTO OPERATOR	8100 SERIES FURNISHED BY SECURITY INTEGRATOR			REC
2	EA	HAND WAVE ACTUATOR	BEA MS41-D FURNISHED BY SECURITY INTEGRATOR			
1	EA	WEATHER STRIPPING	BY DOOR MANUFACTURER			
1	EA	THRESHOLD	655D-223		D	ZER
1	EA	CREDENTIAL READER	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
2	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.2. DOOR FUNCTION: DOORS NORMALLY CLOSED AND LOCKED ENTRY BY CREDENTIAL TO CARD READER ALLOWS ACTIVE DOOR TO RELEASE LATCH. KEY OVERRIDE AVAILABLE.3. PRESSING EXTERIOR ACTUATOR WILL ACTIVATE AUTOMATIC OPERATOR AND OPEN RHR LEAF. AFTER HOURS, EXTERIOR ACTUATOR TO BE DISABLED.4. ALL ELECTRIFIED HARDWARE AND OPERATORS INCLUDING CREDENTIALS, CARD READER, WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

Hardware Group No. HWA-3

For use on Door #(s):

110	112	122	128	134	138
140					

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		F643E/716	IVE
1	EA	ELECTRIFIED MORTISE LOCK	NAC 82271-24V IDP LW1L 70 (CONST SFIC) FURNISHED BY SECURITY INTEGRATOR		613	SAR
1	EA	PERMANENT CORE	BY OWNER		613	BES
1	EA	SURFACE CLOSER	4011 TBSRT		695	LCN
1	EA	FLOOR STOP	FS439		630	IVE
1	EA	CREDENTIAL READER	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.2. DOOR FUNCTION: DOORS NORMALLY CLOSED AND LOCKED ENTRY BY CREDENTIAL TO CARD READER UNLOCKS ELECTRIFIED LOCK AND ALLOWS FOR ENTRY. FREE EGRESS AT ALL TIMES. KEY OVERRIDE AVAILABLE.3. ALL ELECTRIFIED HARDWARE INCLUDING CREDENTIALS, CARD READER, WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

Hardware Group No. HWA-4

For use on Door #(s):

G22C	G22D	122A	122B

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		F643E/716	IVE
1	EA	OFFICE LOCK	8205 LW1 L 70 (CONST SFIC)		613	SAR
1	EA	PERMANENT CORE	BY OWNER		613	BES
1	EA	FLOOR STOP	FS439		704	IVE

Hardware Group No. HWA-5

For use on Door #(s):
G10.1

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP			F643E/716	IVE
1	EA	POWER TRANSFER	EPT10 FURNISHED BY SECURITY INTEGRATOR			695	VON
1	EA	ELEC PANIC HARDWARE	RX-LC-QEL-98-NL-SNB 24 VDC FURNISHED BY SECURITY INTEGRATOR			313_US10B	VON
1	EA	RIM CYLINDER	1E72 FURNISHED BY SECURITY INTEGRATOR			613	BES
1	EA	PERMANENT CORE	BY OWNER			613	BES
1	EA	SURFACE CLOSER	4111 SCUSH TBSRT			695	LCN
1	EA	CUSH SHOE SUPPORT	4110-30 TBSRT			695	LCN
1	EA	CREDENTIAL READER	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				
1	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.
2. DOOR FUNCTION: DOORS NORMALLY CLOSED AND LOCKED ENTRY BY CREDENTIAL TO CARD READER ALLOWS ACTIVE DOOR TO RELEASE LATCH. KEY OVERRIDE AVAILABLE.
3. ALL ELECTRIFIED HARDWARE INCLUDING CREDENTIALS, CARD READER, WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

Hardware Group No. HWA-6

For use on Door #(s):
G10.2

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP			F643E/716	IVE
1	EA	ELEC PANIC HARDWARE	LD-RX-LC-98-NL-SNB FURNISHED BY SECURITY INTEGRATOR			313_US10B	VON
1	EA	RIM CYLINDER	1E72 FURNISHED BY SECURITY INTEGRATOR			613	BES
1	EA	PERMANENT CORE	BY OWNER			613	BES
1	EA	SURFACE CLOSER	4111 SCUSH TBSRT			695	LCN
1	EA	CUSH SHOE SUPPORT	4110-30 TBSRT			695	LCN
1	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.
2. DOOR FUNCTION: DOOR NORMALLY CLOSED AND LOCKED ENTRY BY KEY. DOOR MONITORED BY SECURITY.
3. ALL ELECTRIFIED HARDWARE, WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

Hardware Group No. HWA-7

For use on Door #(s):
G30.1

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		F643E/716	IVE
1	EA	STOREROOM LOCK	9K37D 15D		613	BES
1	EA	PERMANENT CORE	BY OWNER		613	BES
1	EA	ELECTRIC STRIKE	AS REQUIRED FURNISHED BY SECURITY INTEGRATOR		613	
1	EA	AUTO OPERATOR	8100 SERIES FURNISHED BY SECURITY INTEGRATOR			REC
2	EA	HAND WAVE ACTUATOR	BEA MS41-D FURNISHED BY SECURITY INTEGRATOR			
1	EA	CREDENTIAL READER	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.
2. DOOR FUNCTION: DOOR NORMALLY CLOSED AND LOCKED ENTRY BY CREDENTIAL TO CARD READER RELEASES ELECTRIC STRIKE AND ALLOWS FOR ENTRY. KEY OVERRIDE AVAILABLE.
3. ACTUATORS TO ACTIVATE AUTOMATIC OPERATOR AND OPEN DOOR.
3. ALL ELECTRIFIED HARDWARE INCLUDING OPERATOR, CREDENTIALS, CARD READER, WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

Hardware Group No. HWA-8

NOT USED

Hardware Group No. UHW-1

For use on Door #(s):

X01	X01	X02	X02	X03	X03
X05	X05	X06	X06	X08	X08
X09	X09	X10	X10	X11	X11
X13	X13	X14	X14	X15	X15
X17	X17	X18	X18	X19	X19
X20	X20	X21	X21	X22	X22
X23	X23	X24	X24	X26	X26
X27	X27	X28	X28	X29	X29

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	9K37D 15D		626	BES
1	EA	PERMANENT CORE	BY OWNER		626	BES
1	EA	OH STOP	410S		630	GLY
1	EA	SURFACE CLOSER	4011 TBSRT		689	LCN
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	VIEWER	U698 (2 @ ACCESSIBLE UNITS)		626	IVE

Hardware Group No. UHW-1A

For use on Door #(s):
203 228

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5			652	IVE
1	EA	STOREROOM LOCK	9K37D 15D			626	BES
1	EA	PERMANENT CORE	BY OWNER			626	BES
1	EA	ELECTRIC STRIKE	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				
1	EA	AUTO OPERATOR	8100 SERIES FURNISHED BY SECURITY INTEGRATOR				REC
2	EA	HAND WAVE ACTUATOR	BEA MS41-D FURNISHED BY SECURITY INTEGRATOR				
1	EA	GASKETING	488SBK PSA			BK	ZER
2	EA	VIEWER	U698 (2 @ ACCESSIBLE UNITS)			626	IVE
1	EA	CREDENTIAL READER	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR				

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.
2. DOOR FUNCTION: DOORS NORMALLY CLOSED AND LOCKED ENTRY BY CREDENTIAL TO CARD READER ALLOWS ACTIVE DOOR TO RELEASE ELECTRIC STRIKE AND ALLOW FOR ENTRY. KEY OVERRIDE AVAILABLE.
3. AUTOMATIC OPERATOR TO OPEN DOOR AUTOMATICALLY.
4. ALL ELECTRIFIED HARDWARE AND OPERATORS INCLUDING CREDENTIALS, CARD READER, WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

Hardware Group No. UHW-2

For use on Door #(s):
120.2 130.2

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		B643E/716	IVE
1	EA	ELECTRIFIED MORTISE LOCK	NAC 82271-24V IDP LW1L 70 (CONST SFIC) FURNISHED BY SECURITY INTEGRATOR		613	SAR
1	EA	MORTISE CYLINDER	1E74		613	BES
1	EA	PERMANENT CORE	BY OWNER		613	BES
1	EA	SURFACE CLOSER	4111 SCUSH TBSRT		695	LCN
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	39D		D	ZER
1	EA	THRESHOLD	655D-223		D	ZER
1	EA	CREDENTIAL READER	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			

Hardware Group No. UHW-3

For use on Door #(s):
120B.1 130B.1

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	9K3N 15D		626	BES
1	EA	FLOOR STOP	FS439		630	IVE
3	EA	SILENCER	SR64/65 AS REQ		GRY	IVE

Hardware Group No. UHW-4

For use on Door #(s):

120A	120C.1	120D.1	130C.1	130D.1	130E

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK	9K3L 15D		626	BES
1	EA	FLOOR STOP	FS439		630	IVE
3	EA	SILENCER	SR64/65 AS REQ		GRY	IVE

Hardware Group No. UHW-5

For use on Door #(s):

120B.2	120C.2	120D.2	130B.2	130C.2	130D.2

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA	HARDWARE BY MANUFACTURER	HARDWARE BY MANUFACTURER		

Hardware Group No. UHW-CR

For use on Door #(s):
120.1 130.1

Provide each door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ELECTRIFIED MORTISE LOCK	NAC 82271-24V IDP LW1L 70 (CONST SFIC) FURNISHED BY SECURITY INTEGRATOR		626	SAR
1	EA	PERMANENT CORE	BY OWNER		626	BES
1	EA	SURFACE CLOSER	4011 TBSRT		689	LCN
1	EA	FLOOR STOP	FS439		630	IVE
1	EA	GASKETING	488SBK PSA		BK	ZER
1	EA	VIEWER	U698 (2 @ ACCESSIBLE UNITS)		626	IVE
1	EA	CREDENTIAL READER	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	DOOR POSITION SWITCH	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			
1	EA	WIRING HARNESS	FURNISHED BY SECURITY INTEGRATOR FURNISHED BY SECURITY INTEGRATOR			

1. THE HARDWARE SUPPLIER SHALL COORDINATE THE ELECTRIFIED HARDWARE WITH ALL RELATED TRADES.
2. DOOR FUNCTION: DOORS NORMALLY CLOSED AND LOCKED ENTRY BY CREDENTIAL TO CARD READER ALLOWS ACTIVE DOOR TO RELEASE ELECTRIC STRIKE AND ALLOW FOR ENTRY. KEY OVERRIDE AVAILABLE.
3. ALL ELECTRIFIED HARDWARE INCLUDING CREDENTIALS, CARD READER, WIRING, AND CONNECTIONS TO THE OWNER'S NETWORK SHALL BE FURNISHED BY THE OWNER'S SECURITY INTEGRATOR. ALL OTHER ELECTRICAL WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.

END OF SECTION 08 71 00

PACKING SLIP

QUOTE #	AAAQ65187
DATE	12-22-23

A3 Communications Inc.

14 Pelham Ridge Dr. - Greenville, SC 29615

To Al Cope
Clemson University
310 Klugh Ave
Clemson, SC 29634
United States

Phone (864) 656-3311

SALESPERSON	P.O. Number	PAYMENT TERMS	PROJECT
Danny Barrett	CU00610912	NET 30	

QTY	PART NO	DESCRIPTION
		MANNING HALL ACCESS CONTROL & SURVEILLANCE
		Horozonial cabling from door j-box to access cabinet; Conduit pathways; and network provided by others
		DOOR G40.1 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	LD-RX-LC-QEL 98NL 3 313	Von Duprin LD-RX-LC-QEL 98NL-3-313 rim exit device, exit only, 3'
1	LD-RX-LC 98EO 3 313	Von Duprin LD-RX-LC 98EO-3-313 rim exit device, exit only, 3'
2	EPT-10 SP28	Von Duprin EPT-10 Ten 24 Guage Wires SP28
2	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
2	QC-C306P	McKinney 44" Wire Harness
2	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
1	PHYSEC-MISC	Record 8100 Electromechanical Automatic Operator, Single Swing, Clear Anodized Aluminum Finish, Header. (1) BR3-X Logic Module (2) BEA MS41-D Wave to Open switches
		DOOR G40.2 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	LD-RX-LC-QEL 98NL 3 313	Von Duprin LD-RX-LC-QEL 98NL-3-313 rim exit device, exit only, 3'
1	LD-RX-LC 98EO 3 313	Von Duprin LD-RX-LC 98EO-3-313 rim exit device, exit only, 3'
2	EPT-10 SP28	Von Duprin EPT-10 Ten 24 Guage Wires SP28
2	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
2	QC-C306P	McKinney 44" Wire Harness
2	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
1	PHYSEC-MISC	Record 8100 Electromechanical Automatic Operator, Single Swing, Clear Anodized Aluminum Finish, Header.

QTY	PART NO	DESCRIPTION
		(1) BR3-X Logic Module (2) BEA MS41-D Wave to Open switches
		DOOR GST2.1
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	LD-RX-LC-QEL 98NL 3 313	Von Duprin LD-RX-LC-QEL 98NL-3-313 rim exit device, exit only, 3'
1	EPT-10 SP28	Von Duprin EPT-10 Ten 24 Guage Wires SP28
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078-N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR GM1.1
1	LD-RX-LC 98NL 3 710	Von Duprin LD-RX-LC 98NL-3-313 rim exit device, exit only, 3'
1	LD-RX-LC 98EO 3 710	Von Duprin LD-RX-LC 98EO-3-313 rim exit device, exit only, 3'
2	EPT-10 SP28	Von Duprin EPT-10 Ten 24 Guage Wires SP28
2	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
2	QC-C306P	McKinney 44" Wire Harness
2	1078-N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR GM1.2
1	LD-RX-LC 98NL 3 710	Von Duprin LD-RX-LC 98NL-3-313 rim exit device, exit only, 3'
1	LD-RX-LC 98EO 3 710	Von Duprin LD-RX-LC 98EO-3-313 rim exit device, exit only, 3'
2	EPT-10 SP28	Von Duprin EPT-10 Ten 24 Guage Wires SP28
2	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
2	QC-C306P	McKinney 44" Wire Harness
2	1078-N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR G52
1	DS160	Bosch Request-to-Exit, PIR grey
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		ELEVATOR 06 & 07
2	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
		DOOR G10.1 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	LD-RX-LC-QEL 98NL 3 26D	Von Duprin LD-RX-LC-QEL 98NL-3-26D rim exit device, exit only, 3'
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"

QTY	PART NO	DESCRIPTION
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR G10.2 STOREFRONT
1	LD-RX-LC 98NL 3 26D	Von Duprin LD-RX-LC 98NL-3-26D rim exit device, exit only, 3'
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR G10A
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR G22
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR G22A
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR GST2.2
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP

QTY	PART NO	DESCRIPTION
1	LD-RX-LC-QEL 98NL-F 3 26D	Von Duprin LD-RX-LC-QEL 98NL-F-3-26D rim exit device, exit only, 3'
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR G30.1 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	DS160	Bosch Request-to-Exit, PIR grey
1	8300C-630	HES Fire Rated Electric Strike for Cylindrical Locks
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
1	PHYSEC-MISC	Record 8100 Electromechanical Automatic Operator, Single Swing, Clear Anodized Aluminum Finish, Header. (1) BR3-X Logic Module (2) BEA MS41-D Wave to Open switches
		DOOR 100.1 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	LD-RX-LC-QEL 98NL 3 313	Von Duprin LD-RX-LC-QEL 98NL-3-313 rim exit device, exit only, 3'
1	LD-RX-LC 98EO 3 313	Von Duprin LD-RX-LC 98EO-3-313 rim exit device, exit only, 3'
2	EPT-10 SP28	Von Duprin EPT-10 Ten 24 Guage Wires SP28
2	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
2	QC-C306P	McKinney 44" Wire Harness
2	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
1	PHYSEC-MISC	Record 8100 Electromechanical Automatic Operator, Single Swing, Clear Anodized Aluminum Finish, Header. (1) BR3-X Logic Module (2) BEA MS41-D Wave to Open switches
		DOOR 100.2 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	LD-RX-LC-QEL 98NL 3 313	Von Duprin LD-RX-LC-QEL 98NL-3-313 rim exit device, exit only, 3'
1	LD-RX-LC 98EO 3 313	Von Duprin LD-RX-LC 98EO-3-313 rim exit device, exit only, 3'
2	EPT-10 SP28	Von Duprin EPT-10 Ten 24 Guage Wires SP28
2	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
2	QC-C306P	McKinney 44" Wire Harness
2	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
1	PHYSEC-MISC	Record 8100 Electromechanical Automatic Operator, Single Swing, Clear Anodized Aluminum Finish, Header. (1) BR3-X Logic Module (2) BEA MS41-D Wave to Open switches

QTY	PART NO	DESCRIPTION
		DOOR 1ST1
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	RX-LC-98-LF-M996-06-FS F 3 626	Von Duprin RX-LC-98-L-F-M996-06-FSE 3 626 fire exit device
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 130.1
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 116.1
1	DS160	Bosch Request-to-Exit, PIR grey
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 120.1
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 110 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;

QTY	PART NO	DESCRIPTION
		DOOR 112 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 120.2
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 122 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 1ST2
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	RX-LC-98-LF-M996-06-FSE 3 626	Von Duprin RX-LC-98-L-F-M996-06-FSE 3 626 fire exit device
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 128 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC

QTY	PART NO	DESCRIPTION
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 130.2
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 134 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 138 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 140 STOREFRONT
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	

QTY	PART NO	DESCRIPTION
		GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR R01.1
1	DS160	Bosch Request-to-Exit, PIR grey
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR R01.2
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	NAC 82271-24V IDP LW1L 70 26D	Sargent NAC 82271-24V IDP LW1L 70 26D eco-flex electrified mortise lock with REX and DPS, satin chrome, construction SFIC
1	TA2714 4.5 X 4.5 QC8 26D	McKinney TA2714 4.5 X 4.5 26D QC8 power transfer hinge, 8C-28AWG concealed circuit. 8" leads
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	QC-C306P	McKinney 44" Wire Harness
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR P02
1	DS160	Bosch Request-to-Exit, PIR grey
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
		DOOR 203
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	8300C-630	Fire Rated Electric Strike for Cylindrical Locks
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
1	PHYSEC-MISC	Record 8100 Electromechanical Automatic Operator, Single Swing, Clear Anodized Aluminum Finish, Header. (1) BR3-X Logic Module (2) BEA MS41-D Wave to Open switches
		DOOR 228
1	SY-40NKS-T2 00-00004K	HID - SIGNO 40NKS, BLK/SLVR,TERM,CRD PFL T2-SMART,INCL:KEY,BLE:ON,WIEG,LED:RED,FLSH:GRN,BZR,SRF:ON,IPM:OFF,VEL:OFF,TAP
1	8300C-630	Fire Rated Electric Strike for Cylindrical Locks
1	QC-C1500P	McKinney Electrolynx Whip 15'- 2"
1	1078N	GRI- 184-12-W Fire and Security - Recessed Magnetic Contact for Steel Doors;
1	PHYSEC-MISC	Record 8100 Electromechanical Automatic Operator, Single Swing, Clear Anodized Aluminum Finish, Header. (1) BR3-X Logic Module (2) BEA MS41-D Wave to Open switches
		DOOR 230
1	8300C-630	Fire Rated Electric Strike for Cylindrical Locks
1	QC-C1500P	

QTY	PART NO	DESCRIPTION
		McKinney Electrolynx Whip 15'- 2"
1	PHYSEC-MISC	Record 8100 Electromechanical Automatic Operator, Single Swing, Clear Anodized Aluminum Finish, Header. (1) BR3-X Logic Module (2) BEA MS41-D Wave to Open switches

Thanks for the oppportunity to serve

Raceways and nework provided by others

Please sign here to confirm receipt: _____

Thank You For Your Business!

SECTION 08 80 00 - GLAZING

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. Procedures for compliance with certain Green Building Initiative's (GBI) "Green Globes for New Construction, may 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. Glazed curtain walls.
2. Glazed storefront interior and exterior windows.
3. Glazed interior and exterior storefront entrance doors.

B. Related Requirements:

1. Section 088813 "Fire-Rated Glazing."

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 on drawings, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
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 (25 mm), whichever is less.

1) For monolithic-glass lites heat treated to resist wind loads.
2) For insulating glass.

d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

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 (67 deg C), ambient; 180 deg F (100 deg C), 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 insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
2. For monolithic-glass lites, properties are based on units with lites ¼-inch thick.
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 (W/sq. m x K).
    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. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Glass Samples: For each type of the following products, 12 inches (300 mm) square.

1. Insulating glass
2. Tempered glass
3. Spandrel glass
4. Laminated glass.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. 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.

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. 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."

G. 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.
2. Associated Laboratories, Inc.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

I. Composite Mockup Panel: Mockup panel constructed as part of Byrnes construction shall be left in place for reference for Manning construction.

1. If manufacturers of components other than those installed on the existing mock-up panel are proposed by contractor, re-installation of those components may be required to confirm final finish selection.

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.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

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. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.9 WARRANTY

A. 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.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 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 Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Basis-of-Design Product: The design for Low E Insulated Glass product 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 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class 1 Clear and condition indicated.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
4. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

C. Insulating-Glass Units, General: Factory-assembled 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 Part 2 "Insulating-Glass Units" Article.

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 Part 1 "Performance Requirements" Article.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

4. Sealing System: Dual seal, with primary and secondary sealants as follows:

    a. Manufacturer's standard sealants.

5. Spacer Specifications: Manufacturer's standard spacer material and construction.

D. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written instructions.
2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.3 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.

3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.
5. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.4 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 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.5 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).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.6 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. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

2.7 MONOLITHIC FLOAT-GLASS UNITS

A. Uncoated Clear Float-Glass Units (G1): Class 1 (clear)

1. Thickness:

a. (G1) -1 inch Insulated Assembly Unit (25.0 mm) – 1/4-inch Glass

B. Uncoated Clear Float-Glass Units (G1T, G2T): Class 1 (clear) Kind FT (fully tempered) float glass.

1. Thickness:

a. (G1T) - 1 inch Insulated Assembly Unit Tempered (25.0 mm) – 1/4-inch Glass
b. (G2T) – 3/8 inch Tempered (9.0 mm) – 3/8-inch Glass

2.8 INSULATING-GLASS UNITS

A. Solar Control Low-E Insulating-Glass Units (G1) (G1T) (G1S):

1. Basis of Design: Guardian SunGuard SNX 62/27 Clear-Clear Low E Glass. Provide basis of design or equal product by one of the following manufacturers. Products subject to compliance with requirements.

    a. AFGD
    b. Pilkington Building Products
    c. PPG
    d. Viracon
    e. Visteon

2. Minimum Characteristics for 1-inch insulated glass system:

    a. Winter Nightime U-Value .24 min
    b. Summer Daytime U-Value .27 min
    c. Shading Coefficient .31 min
    d. Visible Light .62 min
    e. Solar Heat Gain Coefficient .27 min
    f. Relative Heat Gain 65 min
    g. Ultra Violet % 7% min
    h. Solar Energy % 23% min

3. Overall Unit Thickness and Thickness of Each Lite:

    a. (G1, G1T, G1S, G1P) 1 inch (25.0 mm) and 1/4-inch each lite, ½ inch air space.

4. Interspace Content: Air or Argon as required to meet minimum characteristics.

5. Class 1 (clear) float glass:

    a. Annealed and Kind FT (fully tempered) where indicated – (G1T), (G2T).

6. Low-E Coating: Pyrolytic or sputtered on **second surface.**

B. Ceramic-Coated Spandrel Insulated-Glass Units (G1S):

1. Construction: Provide units that comply with requirements specified for insulating-glass units designated G1 with Low-E Coating on the second surface and the following:

    a. Ceramic Opacifier coating on the fourth surface; color warm gray.

C. Ceramic-Coated Spandrel Insulated-Glass Units (G1P):

1. Construction: Provide units that comply with requirements specified for insulating-glass units designated G1 and the following:

    a. Ceramic Opacifier coating on the second surface; color warm gray.

    b. Opaque Film on the fourth surface, color to be selected by architect from manufacturers full range.

2.9 LAMINATED GLASS

A. Clear Laminated Glass Type at Room No. 134 Test Taking: Two plies of fully tempered float glass.

1. Minimum Thickness of Each Glass Ply: 6 mm.
2. Interlayer Thickness: 0.030 inch.
3. Safety glazing required.

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.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

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 (1270 mm) 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 (3-mm) 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. Set glass lites in each series with proper orientation so that coatings face exterior or interior as specified. Install RoscoView polarized acrylic in orientation indicated by manufacturer.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

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. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket 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. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.7 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.8 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.

END OF SECTION 08 80 00

SECTION 08 83 00 - MIRRORS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:

1. Annealed monolithic glass mirrors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of mirror and mirror mastic, from manufacturer.

C. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

C. Glazing Publications: Comply with the following published recommendations:

1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. 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.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

A. Glass Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.

B. Clear Glass: Mirror Select Quality; ultraclear (low-iron) float glass with a minimum 91 percent visible light transmission.

1. Nominal Thickness: 6.0 mm.

2.2 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A 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, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

1. Adhesive shall have a VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.3 MIRROR HARDWARE

A. Top and Bottom Aluminum J-Channels for Full Length Mirrors: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.05 inch.
2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.062 inch.
3. Finish: Clear bright anodized.

B. Plated Steel Standoff Hardware for Laboratories: Formed-steel standoff shapes with plated finish indicated.

1. Profile: As indicated.

C. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

D. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield 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. Cutouts: Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Beveled.

1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 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. Wall-Mounted Mirrors: Install mirrors with mastic and mirror hardware. 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.

1. Top and Bottom Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.
2. Top Channel/Cleat and Bottom Aluminum J-Channels: Fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.
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.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 08 83 00

SECTION 08 88 13 – FIRE-PROTECTIVE GLAZING

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. Procedures for compliance with certain Green Building Initiative's (GBI) "Green Globes for New Construction, may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fire-protective-rated glazing to be installed in:

a. Hollow metal interior window frames and hollow metal door frame sidelights.
b. Fire rated wood doors.
c. Fire rated hollow metal doors.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For sealants, indicating VOC content.
2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Glass Samples: For each type of glass product; 12 inches (300 mm) square.

1.6 INFORMATIONAL SUBMITTALS

A. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install fire-resistive glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during the remainder of the construction period.

1.10 WARRANTY

A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization 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. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."

B. Safety Glazing Labeling: Permanently mark glazing with certification label of the manufacturer. . Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.4 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Ultraclear Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear), with visible light transmission not less than 91 percent.

C. Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) unless otherwise indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer unless fire-protection or fire-resistance rating is based on another product.
2. Interlayer Thickness: Provide thickness as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.5 FIRE-PROTECTIVE-RATED GLAZING

A. Fire-Protective-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protective ratings indicated, based on positive-pressure testing according to NFPA 257 or UL 9, including the hose-stream test, and shall comply with NFPA 80.

1. Fire-protective-rated glazing required to have a fire-protection rating of 20 minutes for doors (only) shall be exempt from the hose-stream test.

B. Fire-Protective-Rated Glazing Labeling: Permanently mark fire-protective-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether or not glazing has passed the hose-stream test; whether or not glazing meets 450 deg F (250 deg C) temperature-rise limitation; and the fire-resistance rating in minutes.

C. **G3F: Fire-Protective-Rated for Door Sidelights (OH-20); and Interior Windows (OH-20):** 6 to 10-mm thickness, fire-protection-rated tempered glass; and complying with 16 CFR 1201, Category II.

1. Basis of Design Product: SAFTIFirst SuperClear 45-HS– Fire Protective Glazing.

2. Subject to compliance with requirements and glazing sizes indicated on drawings provide a Product from one of the following Manufactures:

   a. AGC Glass Company North America
   b. SAFTI FIRST Fire Rated Glazing (Basis of Design)
   c. Technical Glass Products
   d. Vetrotech Saint-Gobain

3. Glass Types Fire Protective Ratings:

   a. G3F – 20 Minute Fire Rated

4. Fire-Rated Glass Assembly Requirements per IBC 2015 Requirements, Table 716.3 and Table 716.6:
   a. OH-20: Meets Fire Sidelight and Window Assembly with 20 Minute Minimum Fire Rating including Hose Stream Test (OH). NFPA 257 or UL 9

      1) Note: 20 minute rating is required. 45 minute is the minimum that is manufactured in the US to the best of the Architect's knowledge and MEETS THE HOSE STREAM TEST. SAFTIFirst SuperClear 45-HS is a 45 minute rated system. If a less expensive 30 minute rated system can be identified it is acceptable in that it meets the code requirements.

D. **G4F Fire Protective Rated Glass for 45 Minute and G5F for 90 Minute Doors (D-H-45) and (D-H-90 w/ 100 square inches max)**; 3/4-inch thick fire-protection-rated tempered glass complying with 16 CFR 1201, Category II.

1. Basis of Design Products: SAFTIFirst SuperLite X-45 and X-90 Fire Protective Glazing

2. Subject to compliance with requirements and glazing sizes indicated on drawings provide a Product from one of the following Manufactures:

   a. AGC Glass Company North America

b. SAFTI FIRST Fire Rated Glazing (Basis of Design)
c. Schott North America, Inc.
d. Technical Glass Products
e. Vetrotech Saint-Gobain

3. Glass Types Fire Protective Ratings:

a. G4F – 45 Minute Fire Rated - SAFTIFirst SuperLite X-45
b. G5F – 90 Minute Fire Rated - SAFTIFirst SuperLite X-90

4. Fire-Rated Glass Assembly Requirements per IBC 2015 Requirements, Table 716.3 and Table 716.5:

a. D – Meets fire door assembly criteria. NFPA 252 or UL 10B or UL 10C
b. H – Meets fire door assembly hose test. NFPA 252 or UL 10B or UL 10C

A. **G6F: Fire-Protective-Rated for Exterior Window (OH-45);** 6 to 10-mm thickness, fire-protection-rated tempered glass; and complying with 16 CFR 1201, Category II.

1. Basis of Design Product: SAFTIFirst SuperClear 45-HS– Fire Protective Glazing.

2. Subject to compliance with requirements and glazing sizes indicated on drawings provide a Product from one of the following Manufactures:

a. AGC Glass Company North America
b. SAFTI FIRST Fire Rated Glazing (Basis of Design)
c. Technical Glass Products
d. Vetrotech Saint-Gobain

3. Glass Types Fire Protective Ratings:

a. G6F – 45 Minute Fire Rated

4. Fire-Rated Glass Assembly Requirements per IBC 2015 Requirements, Table 716.3 and Table 716.6:
a. OH-45: Meets Window Assembly with 45 Minute Minimum Fire Rating including Hose Stream Test (OH). NFPA 257 or UL 9

2.6 GLAZING ACCESSORIES

A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other **and are approved by testing agencies that listed and labeled fire-protective glazing products with which products are used for applications and ratings indicated**.

1. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building

concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and acetaldehyde concentration does not exceed 9 mcg/cu. m.

B. Glazing Sealants for Fire-Rated Glazing Products: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT. Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated.

1. Dow Corning Corportation
2. GE Construction Sealant
3. Tremco Incorporated
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

C. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; 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; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

D. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 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.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.

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.

B. Examine glazing units to locate fire side and protected side. Label or mark units as needed so that fire side and protected side are readily identifiable. Do not use materials that leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.

B. 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.

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 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 (1270 mm).

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 (3-mm) 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 with proper orientation so that coatings face fire side or protected side as specified.

J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

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 right 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 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop, so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket 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.

D. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial washaway from glass.

3.7 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Remove and replace glass that is damaged during construction period.

D. 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.

END OF SECTION 08 88 13

SECTION 08 91 19 - FIXED LOUVERS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fixed, extruded-aluminum louvers.

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. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).

C. Vertical Louver: Louver with vertical blades (i.e., the axes of the blades are vertical).

D. 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 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. 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 frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.

B. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Wind-Driven-Rain-Resistant Louver:

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. Basis of design: Ruskin Company, EME520DDE.
    b. Air Balance; a division of MESTEK, Inc.
    c. Airolite Company, LLC (The).
    d. Construction Specialties, Inc.
    e. United Enertech.

2. Louver Depth: 5 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080 inch for blades and 0.094 inch for frames.
4. Louver Performance Ratings:

    a. Free Area: Not less than 47% based on 48 inch wide by 48 inch high size.
    b. Size: As indicated on drawings.

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver.

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Insect screening.

B. Secure screen frames 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 type and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Non-rewirable, U-shaped frames.

D. Louver Screening for Aluminum Louvers:

1. Insect Screening: Aluminum, 1/2-inch-square mesh, 0.063-inch wire.

2.5 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

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: Use types and sizes to suit unit installation conditions.

1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.6 FABRICATION

A. Factory assemble louvers 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, including separation between blades and frames at head and sill, 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.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.

1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.

F. 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 concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.7 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: As indicated, or if not indicated, as selected by Architect from manufacturer’s full range.

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 of the Work.

B. 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 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. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 91 19

SECTION 09 21 16.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes: Gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each component of gypsum board shaft wall assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For shaft wall assemblies, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.

1. Depth: As indicated.
2. Minimum Base-Metal Thickness: 0.018 inch.

B. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.

1. Minimum Base-Metal Thickness: 0.018 inch.

C. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.

D. Elevator Hoistway Entrances: Manufacturer's standard J-profile jamb strut with long-leg length of 3 inches, matching studs in depth, and not less than 0.033 inch thick.

E. Room-Side Finish: Finished as indicated.

F. Shaft-Side Finish: Manufacturer’s standard moisture resistant finish

G. Insulation: Sound attenuation blankets.

2.3 PANEL PRODUCTS

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

B. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Georgia-Pacific Gypsum LLC, Subsidiary of Georgia Pacific; Dens-Glass Ultra Shaftliner.
b. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner XP.
c. USG Corporation; Sheetrock Brand Mold Tough Gypsum Liner Panel.

2. Thickness: 1 inch.
3. Long Edges: Double bevel.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

C. Gypsum Board: As specified in Division 09 Section "Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

A. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

1. Protective Coating: ASTM A 653/A 653M, G60, hot-dip galvanized unless otherwise indicated.

B. Firestop Tracks: 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. Products: Subject to compliance with requirements, provide one of the following:

a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.
b. Grace Construction Products; FlameSafe FlowTrak System.
c. Metal-Lite, Inc.; The System.
d. Steel Network Inc. (The); VertiClip SLD Series.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Division 09 Section "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.

E. Sound Attenuation Blankets: As specified in Division 09 Section "Gypsum Board."

F. Acoustical Sealant: As specified in Division 09 Section "Gypsum Board."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Division 07 Section "Applied Fireproofing."

B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
2. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.033-inch minimum thickness of base metal (uncoated), accurately positioned and secured behind at least one layer of face panel.

D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

I. Cant Panels: At projections into shaft exceeding 4 inches, install 1/2- or 5/8-inch-thick gypsum board cants covering tops of projections.

1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft wall framing.
2. Where steel framing is required to support gypsum board cants, install framing at 24 inches o.c. and extend studs from the projection to shaft wall framing.

J. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 21 16.23

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.
3. Grid suspension systems for gypsum board ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For partitions requiring seismic bracing, submit coordinated set of partition anchorage drawings prior to installation to include the following:

1. Description, layout, and location of items to be anchored or braced with anchorage or braced points noted and dimensioned.
2. Details of anchorage or bracing at large scale with all members, parts brackets shown, together with all connections, bolts, and welds clearly identified.
3. Numerical value of design seismic brace loads.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation Reports: For embossed steel studs and tracks or equivalent gauge steel studs and tracks, firestop tracks, post-installed anchors, and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association and Steel Stud Manufacturers Association (SSMA).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft..

2.2 FRAMING SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CEMCO; California Expanded Metals Products, Inc.
2. ClarkDietrich Building Systems, LLC
3. Marino\WARE.
4. Steel Network, Inc. (The).
5. Telling Industries.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.

C. Studs and Tracks: ASTM C 645. Use one of the following:

1. Steel Studs and Tracks:

a. Minimum Base-Metal Thickness: As required by performance requirements for horizontal deflection.
b. Depth: As indicated on Drawings.

2. Embossed Steel Studs and Tracks: Roll-formed and embossed with surface deformations to stiffen the framing members so that they are structurally equivalent to conventional ASTM C 645 steel studs and tracks.

    a. Minimum Base-Metal Thickness: As required by horizontal deflection performance requirements.
    b. Depth: As indicated on Drawings.

3. Exception: Members that can show certified third party testing with gypsum board in accordance with ICC ES AC86 (Approved May 2012) need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C 645. The submission of an evaluation report is acceptable to show conformance to this requirement. Use ASTM C 645 steel, in thickness of minimum 0.019 inch.

D. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Track System: ASTM C 645 top track with 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
2. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

    a. Products: Subject to compliance with requirements, provide one of the following:

        1) CEMCO; California Expanded Metal Products Co.; SLP-TRK Slotted Deflection Track.
        2) ClarkDietrich Building Systems; MaxTrak Slotted Deflection Track.
        3) MarinoWARE.
        4) The Steel Network, Inc.; VertiTrack VTD.

E. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of 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. Products: Subject to compliance with requirements, provide one of the following:

    a. CEMCO; California Expanded Metal Products Co.; FAS Track.
    b. ClarkDietrich Building Systems; BlazeFrame.
    c. Fire Trak Corp; Fire Trak System attached to studs with Fire Trak Posi Klip.
    d. MarinoWARE; FAS Track 1000.
    e. Metal-Lite; The System.

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.018 inch.

G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 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: 0.0179 inch.
2. Depth: 7/8 inch unless otherwise indicated on Drawings.

I. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

J. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 3/4 inch.
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

C. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated.

D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.

1. Depth: As indicated on Drawings.

E. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
2. Steel Studs and Tracks: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0179 inch.
b. Depth: As indicated on Drawings.

3. Embossed Steel Studs and Tracks: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0190 inch.
b. Depth: As indicated on Drawings.

4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

a. Minimum Base-Metal Thickness: 0.0179 inch.

5. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical or hat shaped.

F. Grid Suspension System for Gypsum Board 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:

a. Armstrong World Industries, Inc.: Drywall Grid Systems.
b. Chicago Metallic Corporation: Drywall Grid System.
c. USG Corporation: Drywall Suspension System.

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 of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. 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 in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: 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.

E. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 07 21 00 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 24 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend 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 suspension system.

    a. 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 locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure 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 hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure 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 roof deck.

6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

C. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Georgia-Pacific Gypsum LLC.
2. National Gypsum Company.
3. USG Corporation.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

D. Abuse-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested in accordance with ASTM C1629/C1629M.

1. Core: 5/8 inch, Type X.

2. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.
3. Indentation: ASTM C1629/C1629M, meets or exceeds Level 1 requirements.
4. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 2 requirements.
5. Hard-Body Impact: ASTM C1629/C1629M, meets or exceeds Level 1 requirements
6. Long Edges: Tapered.
7. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

E. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

F. Fiber Reinforced Interior Gypsum Board ASTM C1278: Standard Classification for Fiber Reinforced Interior Gypsum Panel Products.

1. Product for use with roof assembly UL Design No. P546 to be installed on top of metal roof deck.
2. Basis of Design: Subject to compliance with project requirements, the design is based on the following: “USG Corporation, Fiberock® Brand Abuse Resistant Panels Regular and type X Panels”

    a. Abrasion Resistance; Level 1.
    b. Indentation Resistance; Level 1.
    c. Soft Body Impact Resistance; Level 2.
    d. Hard Body Impact Resistance; Level 1.

3. UL Type Designation “FRX-G”.
4. ASTM E84 Surface-Burning Characteristics:

    1) Flame Spread: 5.
    2) Smoke Developed: 0.

5. Thickness: 5/8” (15.9 mm).
6. Length: 8’-0” (2438)
7. Widths: 48" (1219).
8. Weight: 2.4 lb./ft^2.
9. Long Edges: Tapered.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

1. Thickness: 5/8 inch.
2. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:

    a. Cornerbead.
    b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    c. L-Bead: L-shaped; exposed long flange receives joint compound.
    d. Expansion (control) joint.
    e. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Fry Reglet Corp.
    b. Gordon, Inc.
    c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Finish: Painted to match gypsum board.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
2. Fill Coat: For second coat, use drying-type, all-purpose compound.
3. Finish Coat: For third coat, use drying-type, all-purpose compound.
4. Skim Coat: For final coat of Level 5 finish, use high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. 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. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install 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.

D. 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.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support 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.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to 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 panels.
b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. 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 one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. 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.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 APPLYING TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 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.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. Curved-Edge Cornerbead: Use at curved openings.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

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 for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: 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 Section 09 91 23 "Interior Painting."

E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 13 – CERAMIC TILING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall tile.
2. Paver tile.
3. Thresholds.
4. Metal edge strips.
5. Crack suppression membrane for thin-set tile installations.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces. Show locations of all tile transitions and thresholds.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. Dynamic Coefficient of Friction: Not less than 0.42.

C. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

D. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
2. Obtain crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Thresholds.
2. Crack isolation membrane.
3. Waterproof membrane.

D. Basis-of-Design Products: Subject to compliance with requirements, provide Basis-of-Design products as indicated on finish schedule or a comparable product by one of the following manufacturers:

1. Dal-Tile (Basis of Design).
2. American Olean.
3. Crossville Inc.

2.3 TILE PRODUCTS

A. Basis of Design: Subject to compliance with requirements, provide products as indicated on the drawings. See Finish Legend and Interior Elevations for installation patterns.

B. Grout colors as indicated on finish legend.

C. Trim Units: Coordinated with sizes, characteristics, and coursing of adjoining tile where applicable and as indicated on finish legend:

1. Base cap: Metal trim
2. Cove profile: Metal trim with coordinating corner pieces as provided by manufacturer, no mitered cuts.
3. External Corners: Metal trim

D. “PT-1” TYPICAL FLOOR TILE

1. Size: 12x24
2. Composition: Glazed porcelain
3. Finish: Matte finish

E. “PT-2” SHOWER ROOM FLOOR TILE

1. Size: 2x2 Mosaic sheet
2. Composition: Glazed porcelain
3. Finish: Matte finish

F. “PTB-1” TYPICAL TILE BASE

1. Size: 6x24 base. Cut from “PT-1,” 12x24 tile. Install cut side down.
2. Composition: Glazed porcelain
3. Finish: Matte finish
4. Use with specified metal transitions and cove profile.

G. “CT-1” TYPICAL WALL TILE

1. Size: 4x16 subway tile
2. Composition: Glazed ceramic.
3. Finish: Gloss finish

H. "CT-2" ACCENT WALL TILE

1. Size: Decorative Mosaic Sheet
2. Composition: Glazed ceramic
3. Finish: Gloss finish

I. "CT-3" ACCENT WALL TILE

1. Size: Decorative Mosaic Sheet
2. Composition: Glazed ceramic
3. Finish: Gloss finish

J. "CT-4" ACCENT WALL TILE

1. Size: 4x16 subway tile
2. Composition: Glazed ceramic.
3. Finish: Matte finish

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. "TR-8" Marble Threshold: Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Match height of shower receptacle edge to create a flush transition between receptacle edge and top of threshold.

a. Color as indicated on legend.

2.5 SETTING MATERIALS

A. Large Format Tile Mortar (Thin-set or Medium-bed): ANSI A118.4, ANSI A118.15, ANSI A118.11.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Custom Building Products.
b. Laticrete International, Inc.
c. Mapei Corporation.

2. Provide premium, prepackaged, polymer-enriched, dry-mortar mix combined with water at Project site.
3. For floor applications, provide mortar that complies with requirements for nonslump formula in addition to other requirements in ANSI A118.4.
4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

5. Provide where individual tile size has a dimensional length greater than 15 inches on any side of the tile.

B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Custom Building Products.
b. Laticrete International, Inc.
c. MAPEI Corporation.
d. Mer-Kote Products, Inc.

2. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

C. 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).

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Custom Building Products.
b. Laticrete International, Inc.
c. MAPEI Corporation.
d. Summitville Tiles, Inc.

2.6 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
b. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
c. MAPEI Corporation; Mapelastic L (PRP M19).
d. Mer-Kote Products, Inc.; Hydro-Guard 2000.

2.7 CRACK-SUPPRESSION MEMBRANE FOR THIN-SET TILE INSTALLATIONS

A. General: Manufacturer's standard product that complies with ANSI A118.12, selected from the following.

B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid latex rubber.

1. Products:

a. Laticrete International, Inc.; Laticrete Blue 92 Anti-Fracture Membrane.
b. Merkrete; Fracture Guard 5000.

2.8 GROUT MATERIALS

A. Water-Cleanable Epoxy Grout: ANSI A118.3.

1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

B. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on the finish schedule or a comparable product of the following:

1. Mapei.
2. LATICRETE

2.9 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Section 07 92 00 "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

2.10 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips angle or L-shape, height to match tile and setting-bed thickness, metallic, designed specifically for applications as indicated.

1. Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile. Locations and finishes as indicated on finish floor plans and finish legend.
2. Basis of design products: Schluter.

a. "TR-1" Schluter Schiene
b. "TR-4" Schluter Quadec
c. "TR-6" Schluter Rondec
d. "TR-7" Schluter Reno U

3. Material: Aluminum.
4. Finish: Anodized.

C. Cove Profiles, thickness to match tile and setting-bed thickness:

1. Install where porcelain floor tile meets ceramic wall tile or porcelain base. Include external and internal corner pieces, do not miter cut cove profile.
2. Basis of design products: Schluter. Finish as indicated on finish legend.

a. "TR-2" Schluter Dilex EHK

D. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

E. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.11 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances

that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

2. Verify that concrete substrates for tile floors installed with adhesives or thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

B. Field-Applied Temporary Protective Coating: If 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.

3.3 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

1. Perform flood test with 2 inch head of water for 24 hours.

3.4 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over crack isolation membrane until membrane has cured..

3.5 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series

"Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:

    a. Tile floors in wet areas.
    b. Tile floors composed of tiles 8 by 8 inches or larger.
    c. Tile floors composed of rib-backed tiles.

B. Wall tile and base to be installed prior to floor tile.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. 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.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Floor Tile: 1/8 inch.
2. Wall Tile: 1/8 inch.

G. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Minimize lippage in accordance with ANSI A137.1 and ANSI A108.02, maximum allowable lippage as applicable to products specified.

3.6 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 latex-portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

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 protective cleaner from tile surfaces.

3.7 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Large Format Tile Installation TCNA F125 Full: Thin-set mortar on crack isolation membrane.

a. Tile Type: As indicated on Drawings.
b. Thin-Set Mortar: LHT Medium-bed, modified dry-set.
c. Grout: Water-cleanable epoxy grout.

2. Tile Installation TCNA F122: Thin-set mortar on waterproof membrane.

a. Tile Type: As indicated on Drawings.
b. Thin-Set Mortar: Latex-portland cement mortar.
c. Grout: Water-cleanable epoxy grout.

3. Tile Installation TCNA F121: Thick-set mortar on waterproof membrane.

a. Tile Type: As indicated on Drawings.
b. Thin-Set Mortar: Latex-portland cement mortar.
c. Grout: Water-cleanable epoxy grout.

4. Tile Installation TCNA F125 Full: Thin-set mortar on crack isolation membrane.

a. Tile Type: As indicated on Drawings.
b. Thin-Set Mortar: Latex-portland cement mortar.
c. Grout: Water-cleanable epoxy grout.

5. TCNA F111 and ANSI A108.1C: Cement mortar bed (thickset) with cleavage membrane.

a. Ceramic Tile Type: As indicated on Drawings.
b. Bond Coat for Cured-Bed Method: Modified dry-set mortar.
c. Grout: High-performance sanded grout.

B. Interior Wall Installations, Metal Studs or Furring:

1. Tile Installation TCNA W244: Cementitious or Epoxy Bond Coat over Cement backer board

a. Tile Type: As indicated on Drawings.
b. Thin-Set Mortar: Latex-portland cement mortar.
c. Grout: Water-cleanable epoxy grout

C. Bathtub/Shower Wall with Prefabricated Receptor:

1. Tile Installation TCNA B412-19
a. Tile Type: As indicated on Drawings.
b. Thin-Set Mortar: Latex-portland cement mortar
c. Grout: Water-cleanable epoxy grout

END OF SECTION 09 30 13

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels, stretch ceiling and exposed suspension systems for ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Laboratory Test Reports: For ceiling products, indicating compliance with requirements for low-emitting materials.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which suspension systems will be attached.
3. Size and location of initial access modules for acoustical panels.
4. Items penetrating finished ceiling including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.

5. Perimeter moldings.

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

1.9 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.

1.10 FIELD 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

C. 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.

2.2 ACOUSTICAL PANELS, GENERAL

A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.

C. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

D. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.

E. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

F. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

G. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS

A. Basis-of-Design Products: Subject to compliance with requirements, provide Basis-of-Design product as indicated on the finish schedule or comparable by one of the following:

1. Armstrong Industries.
2. USG Corporation.
3. CertainTeed Corporation.

B. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Manufacturer’s standard.
2. Pattern: As indicated.

C. Color: As indicated on finish schedule.

D. Edge/Joint Detail: Manufacturer’s standard as indicated.

E. Thickness: As indicated.

F. Modular Size: As indicated.

G. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

H. Suspension Grid: 9/16 inch and 15/16 inch as indicated.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.

B. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Power-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 hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch-diameter wire.

E. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

F. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch-diameter bolts.

G. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

I. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

2.5 METAL SUSPENSION SYSTEM

A. Basis-of-Design Products: Subject to compliance with requirements, provide Basis-of-Design product as indicated on the finish schedule or comparable by one of the following:

1. Armstrong Industries.
2. USG Corporation.
3. CertainTeed Corporation.

B. Narrow-Face, Capped, Double-Web, 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 9/16-inch-wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: As selected by Architect from manufacturer’s full range.

C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) type.
3. Face Design: Flat, flush.
4. Cap Material: Steel cold-rolled sheet.
5. Cap Finish: As selected by Architect from manufacturer’s full range.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Product: Subject to compliance with requirements, provide product as indicated on the finish schedule.

B. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:

1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.7 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, provide one of the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. USG Corporation; SHEETROCK Acoustical Sealant.

B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
3. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. 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 panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate 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. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

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.

1. Arrange directionally patterned acoustical panels as follows:

a. As indicated on reflected ceiling plans.

2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
5. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

B. Related Sections:

1. 09 65 19 Resilient Tile Flooring

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient stair accessories

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

C. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products 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.

1.7 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 resilient products 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. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Products listed below are to be sourced from the same manufacturer.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or an equal product by one of the following manufacturers or another manufacturer not listed: Equal products by the manufacturers listed or another manufacturer is to be approved by addendum by the Architect prior to submission of bids.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Johnsonite/Tarkett (basis-of-design)
b. Mannington
c. Allstate Surfaces
d. VPI Corp

2.2 THERMOPLASTIC-RUBBER BASE (RB-1)

A. Resilient Base: Tarkett Perceptions

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous).

C. Minimum Thickness: 0.125 inch.

D. Profile: As indicated on Drawings

E. Height: 4.25 inches.

F. Lengths: Coils in manufacturer's standard length.

G. Outside Corners: Job formed except where indicated below.

H. Outside Corners: Preformed with 12-inch legs.

1. To be provided at window jambs where windows extend to floor.

I. Inside Corners: Job formed.

J. Colors: As indicated on Drawings.

2.3 THERMOPLASTIC-RUBBER BASE (RB-2)

A. Cove Profile Resilient Base:

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous).

C. Minimum Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors: As indicated on Drawings.

2.4 RUBBER STAIR ACCESSORIES

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

B. Manufacturers: Subject to compliance with requirements, provide products as indicated on Finish Schedule. Subject to compliance with requirements, other available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Johnsonite; a Tarkett company (basis-of-design)
2. VPI Corporation.
3. Mannington
4. Allstate Surfaces

C. Stair Treads: ASTM F2169 (ST-1)

1. Type: TS (rubber, vulcanized thermoset).
2. Nosing Style: Angled, adjustable to cover angles between 60 and 90 degrees.
3. Nosing Height: 2 inches.
4. Thickness: 1/4 inch and tapered to back edge.
5. Size: Lengths and depths to fit each stair tread in one piece.
6. Grit Tape: Color as indicated on drawings
7. Surface Pattern/Texture: As indicated on Drawings
8. Color: As indicated on Drawings

2.5 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 resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less.

C. Metal Edge Strips: Extruded aluminum with mill finish, nominal 2 inches wide, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

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 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. 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.

C. Do not install resilient products until they are same temperature as the 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.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 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. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible.

G. Preformed Outside Corners: Install preformed corners at window jambs where windows extend to the floor before installing straight pieces.

1. Leg turning back against window to be cut to fit snug against window frame and leg along wall to remain full 12-inch length for full length adhesion to the wall.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 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

SECTION 09 65 19 - RESILIENT TILE FLOORING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Luxury vinyl floor tile.
2. Rubber floor tile.
3. Supplementary components and accessories normally furnished or otherwise necessary for a complete installation.

1.3 REFERENCES

A. Definitions:

1. Manufacturer: Means the resilient tile flooring manufacturer unless otherwise indicated.

1.4 SUBMITTALS

A. Action Submittals:

1. Product Data: For each type of product.
2. Shop Drawings: For each type of resilient floor tile.

a. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
b. Show details of special patterns.

3. Product Schedule: For floor tile. Use same designations indicated on Drawings.

B. Informational Submittals:

1. Qualification Data: For qualified installer.

C. Closeout Submittals:

1. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 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 indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.

1.6 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.

1.7 FIELD 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 and after installation.
2. During installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

1. Close spaces to traffic during floor tile installation.
2. Close spaces to traffic for 48 hours after floor tile installation.

C. Install floor tile after other finishing operations, including painting, have been completed.

1.8 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 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, 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.

2.2 LUXURY VINYL TILE (LVT-1)

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or an equal product by one of the following manufacturers or another manufacturer not listed: Equal products by the manufacturers listed or another manufacturer is to be approved by addendum by the Architect prior to submission of bids.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. J+J Flooring Group (Basis-of Design)
b. Shaw Contract
c. Patcraft

B. Size: (Plank) As indicated on Drawings

C. Thickness: 3 mm.

D. Wear Layer: 20mil

E. Color: As indicated on Drawings

F. Edge Treatment: None/Square Edge

G. Installation: Glue down per manufacturer’s standard

H. Installation Pattern: As indicated on Drawings

2.3 LUXURY VINYL TILE (LVT-2)

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or an equal product by one of the following manufacturers or another manufacturer not listed: Equal products by the manufacturers listed or another manufacturer is to be approved by addendum by the Architect prior to submission of bids.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Shaw Contract (Basis-of Design)

b. J+J Flooring Group
c. Patcraft

B. Size: As indicated on Drawings

C. Thickness: 3 mm.

D. Wear Layer: 20mil

E. Color: As indicated on Drawings

F. Edge Treatment: None/Square Edge

G. Installation: Glue down per manufacturer's standard

H. Installation Pattern: As indicated on Drawings

2.4 RUBBER FLOOR TILE (RF-1)

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or an equal product by one of the following manufacturers or another manufacturer not listed: Equal products by the manufacturers listed or another manufacturer is to be approved by addendum by the Architect prior to submission of bids.

B. Products: Rubber floor tile is to be sourced from the same manufacturer as resilient base, stair and accessory products.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Johnsonite/Tarkett (basis-of-design)
b. Mannington
c. Allstate Surfaces
d. VPI Corp

2.5 ACCESSORIES – METAL TRANSITION (TR-5)

1. Manufacturers:

a. Schluter (basis-of-design)
b. Kuberit
c. Other approved equal

2. Style/Profile: As indicated on Drawings
3. Finish/Color: Anodized aluminum.
4. Location: LVT to Concrete

2.6 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation supplied, recommended, or required by the manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

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.

1. 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.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Installation of resilient tile flooring indicates acceptance of surfaces and conditions.

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 floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than 3 tests in each installation area and with test areas evenly spaced in installation areas.

a. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Do not proceed with installation until substrates have a relative humidity level measurement of no more than 85 percent.

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. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

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.

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 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

SECTION 09 65 36 - STATIC-CONTROL RESILIENT FLOORING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Static-control, solid vinyl floor tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:

a. Examination and preparation of substrates to receive static-control resilient flooring.
b. Installation techniques required for specified products.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For each type of static-control resilient flooring. Include floor-covering layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

2. Show locations of inscribed maintenance floor tiles in conductive, solid vinyl floor tile installation areas.
3. Show grounding locations of grounding strips and connections.

D. Samples for Verification: For each type of static-control resilient flooring and in each color, pattern, and texture required, of size indicated below:

1. Floor Tile: Full-size units.

E. Product Schedule: For static-control resilient flooring. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For static-control resilient flooring, for tests performed by a qualified testing agency.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of static-control resilient flooring to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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 one box for every 50 boxes, or fraction thereof, of each type, color, and pattern of floor tile installed.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in installation techniques required by manufacturer for specified static-control resilient flooring.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required for specified products.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups for static-control resilient flooring including resilient base and accessories.

    a. Size: Minimum 100 sq. ft. for each type, color, and pattern in locations indicated.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended in writing by manufacturer, but not less than 50 deg F or more than 90 deg F.

1. Floor Tile: Store on flat surfaces.

1.10 PROJECT CONDITIONS

A. Maintain ambient temperatures in spaces to receive static-control resilient flooring within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, 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 in installation areas within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during static-control resilient flooring installation.

D. Close spaces to traffic for 48 hours after static-control resilient flooring installation.

E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Verify flooring products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 STATIC-CONTROL, SOLID VINYL FLOOR TILE

A. Provide products as indicated on drawings.

B. Source Limitations: Obtain floor tile from single source from single manufacturer.

C. Static-Control Properties: As determined by testing identical products in accordance with test method indicated by an independent testing and inspecting agency.

D. Construction: ASTM F1700, Class I (monolithic), Type A (smooth surface).

E. Thickness: Manufacturer's standard, but not less than 0.08 inch (2 mm).

F. Size: 24 by 24 inches (610 by 610 mm).

G. Colors and Patterns: As indicated.

H. Maintenance Floor Tiles: Special floor tiles inscribed "Conductive floor. Do not wax."

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.

1. Verify adhesives have a VOC content of 50 g/L or less.
2. Verify adhesive complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. M, and acetaldehyde concentration does not exceed 9 mcg/cu. m.

C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.

D. Floor Polish: Provide protective, static-control liquid floor polish products recommended in writing by floor-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for 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 installation or static-control characteristics of floor coverings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates in accordance with manufacturer's written instructions to ensure successful installation of static-control resilient flooring and electrical continuity of floor-covering systems.

B. Concrete Substrates: Prepare in accordance with ASTM F710.

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 floor-covering 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 in writing by manufacturer. Proceed with installation only after substrate alkalinity is not less than 6 or more than 8 pH unless otherwise recommended in writing by flooring manufacturer.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

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 static-control resilient flooring until it is same temperature as space where it is to be installed.

1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.3 INSTALLATION, GENERAL

A. Install static-control resilient flooring in accordance with manufacturer's written instructions.

B. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.

1. For adhesively installed flooring, embed grounding strips in static-control adhesive.

C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

1. Extend static-control resilient flooring below built-in items and permanent, but movable, items that allow for a flexible layout where indicated on Drawings.

D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings.

E. Extend static-control resilient flooring to center of door openings where flooring or color transitions occur.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install static-control resilient flooring on covers for telephone and electrical ducts, and similar items in installation areas. Maintain overall continuity of color and pattern with pieces of static-control resilient flooring installed on covers. Tightly adhere static-control resilient flooring edges to substrates that abut covers and to cover perimeters.

H. Adhesive Installation: Adhere static-control resilient flooring to substrates using a full spread of static-control 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 INSTALLATION OF FLOOR TILE

A. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.

1. Lay floor tiles square with room axis, pattern as indicated on drawings.

B. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.

C. In each space where conductive, solid vinyl floor tile is installed, install maintenance floor tile identifying conductive floor tile in locations approved by Architect.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to test electrical resistance of static-control resilient flooring in accordance with ASTM F150 for compliance with requirements.

1. Arrange for testing after the following:

a. Static-control adhesives have fully cured.
b. Static-control resilient flooring has stabilized to ambient conditions.
c. Ground connections are completed.

2. Arrange for testing of static-control resilient flooring before and after performing floor polish procedures.

B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.

B. Perform the following operations immediately after completing static-control resilient flooring:

1. Remove static-control adhesive from exposed surfaces.
2. Remove dirt and blemishes from exposed surfaces.
3. Sweep and vacuum surfaces thoroughly.
4. Damp-mop surfaces to remove marks and soil.

C. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

1. Do not wax static-control resilient flooring.
2. If recommended in writing by manufacturer, apply protective static-control floor polish formulated to maintain or enhance floor covering's electrical properties. Before polishing, do the following:

a. Ensure that static-control resilient flooring surfaces are free from soil, static-control adhesive, and surface blemishes.
b. Verify that both floor polish and its application method are approved by manufacturer and that floor polish will not leave an insulating film that reduces static-control resilient flooring's effectiveness for static control.

D. Cover static-control resilient flooring and protect from rolling loads until Substantial Completion.

END OF SECTION 09 65 36

SECTION 096813 - TILE CARPETING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section includes modular carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot. Use same designations indicated on Drawings.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Type, color, and location of insets and borders.

8. Type, color, and location of edge, transition, and other accessory strips if specified. Use same designations indicated on Drawings.
9. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, 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. yd.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.10 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

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 demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE (CPT-1)

A. Basis-of-Design Products: Subject to compliance with requirements, provide Basis-of-Design products as indicated on finish schedule or a comparable product by one of the following manufacturers:

1. Shaw Contract (Basis of Design)
2. Patcraft
3. Interface

B. Fiber Content: 100% Nylon

C. Dye Method: Solution Dyed

D. Color: As indicated on Drawings.

E. Pattern: As indicated on Drawings.

F. Pile Characteristics: Multi-level pattern loop

G. Primary Backing/Backcoating: Manufacturer's standard composite high recycled content materials.

H. Sizes: As indicated on Drawings.

I. Applied Soil-Resistance Treatment: Manufacturer's standard material.

J. Antimicrobial Treatment: Manufacturer's standard material.

2.2 CARPET TILE (CPT-2)

A. Basis-of-Design Products: Subject to compliance with requirements, provide Basis-of-Design products as indicated on finish schedule or a comparable product by one of the following manufacturers:

1. J+J Flooring Group (Basis of Design)
2. Shaw Contract
3. Interface

B. Fiber Content: 100% Nylon

C. Dye Method: Solution Dyed

D. Color: As indicated on Drawings.

E. Pattern: As indicated on Drawings.

F. Pile Characteristics: Patterned loop

G. Primary Backing/Backcoating: Manufacturer's standard composite high recycled content materials.

H. Sizes: As indicated on Drawings.

I. Applied Soil-Resistance Treatment: Manufacturer's standard material.

J. Antimicrobial Treatment: Manufacturer's standard material.

2.3 CARPET TILE (CPT-3) – WALK-OFF CARPET

A. Basis-of-Design Products: Subject to compliance with requirements, provide Basis-of-Design products as indicated on finish schedule or a comparable product by one of the following manufacturers:

1. Shaw Contract (Basis of Design)
2. J+J Flooring Group
3. Patcraft

B. Fiber Content: 100% Nylon

C. Dye Method: Solution Dyed

D. Color: As indicated on Drawings.

E. Pattern: As indicated on Drawings.

F. Pile Characteristics: Multi-Level Pattern Cut loop

G. Primary Backing/Backcoating: Manufacturer's standard composite high recycled content materials.

H. Sizes: As indicated on Drawings.

I. Applied Soil-Resistance Treatment: Manufacturer's standard material.

J. Antimicrobial Treatment: Manufacturer's standard material.

2.4 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.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Metal Edge/Transition Strips: Where specified, extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints. Carpet to butt against 5mm LVT, no transitions unless specified.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: Full spread adhesive.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 91 13 - EXTERIOR PAINTING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Concrete
2. Steel Substrates.

B. Related Sections include the following:

1. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Step coats on Samples to show each coat required for system.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Final approval of color selections will be based on benchmark samples.

a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. Duron, Inc.

3. ICI Paints.
4. Miller Paint.
5. Porter Paints.
6. PPG Architectural Finishes, Inc.
7. Rose Talbert
8. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system 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.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: Match exterior prefinished material as identified on Exterior Finish Notes on A4.1 and as approved by architect.

2.3 PRIMERS/SEALERS

A. Bonding Primer (Water Based): MPI #17.

1. VOC Content: E Range of E3.

2.4 METAL PRIMERS

A. Waterborne Galvanized-Metal Primer: MPI #134.

1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

2.5 EXTERIOR LATEX PAINTS

A. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).

1. VOC Content: E Range of E1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance of paint materials with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Concrete Substrates:

1. Latex System: MPI EXT 4.2A.

a. Prime Coat: Exterior, alkali-resistant, water-based primer
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Exterior latex paint, semigloss.

B. Steel Substrates:

1. Alkyd System:

a. Prime Coat: Alkyd metal primer.
b. Intermediate Coat: Matching topcoat.
c. Topcoat: Exterior alkyd enamel, semigloss.

END OF SECTION 09 91 13

SECTION 09 91 23 - INTERIOR PAINTING

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Steel
2. Galvanized metal.
3. Gypsum board.

1.3 DEFINITIONS

A. Gloss Level 1: Traditional matte finish (flat). Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 2: High-side sheen flat finish. Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 3: Traditional eggshell-like finish. 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 4: Satin-like finish. 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level 5: Traditional semigloss finish. 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 6: Traditional gloss finish. 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level 7: High gloss finish. More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: Two percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, unless otherwise indicated in Part 3:

1. Sherwin-Williams Company (The) (Basis-of-Design, Clemson standard).
2. Benjamin Moore & Co.
3. PPG Paints.

B. Products, General: Refer to end of Part 3 of this Section for specific products and listing of applications for each product.

C. Colors: As indicated on the finish schedule.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Dry-Fog Coatings: 150 g/L.
4. Primers, Sealers, and Undercoaters: 100 g/L.
5. Rust-Preventive Coatings: 100 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Shellacs, Clear: 730 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Apply primers and finish coats in accordance with manufacturer’s recommended wet-film thickness, square foot per gallon, and mil thickness per coat. Do not add solvent or thinner to paint and coating products.

F. Allow adequate during time before handling and before applying subsequent coats. Low VOC and water-based paint systems require longer drying times. Comply with manufacturer’s written instructions. Protect in accordance with “Cleaning and Protection” Article below.

G. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.

f. Plastic conduit.
g. Tanks that do not have factory-applied final finishes.
h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIRE-RATED ASSEMBLIES

A. By stenciling, permanently identify corridor partitions, smokestop partitions, horizontal exit partitions, exit enclosures and fire walls. Above decorative ceiling line and in concealed spaces, on both sides of wall, apply a minimum one-inch wide red line interrupted at maximum 12-ft. spacing with the wording “X HOUR FIRE AND SMOKE BARRIER – PROTECT ALL OPENINGS” in 4-inch high letters with “X” designating the appropriate hourly rating.

3.5 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.6 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.7 INTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer, rust inhibitive, water based.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer, B66-310 Series. Applied at a wet film thickness of minimum 5.0 mils or 1.8 dry.

b. Intermediate Coat: Water-based acrylic, interior, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5).

1) Products: Subject to compliance with requirements, provide the following:

a) Sherwin-Williams; Pro Industrial High Performance Acrylic, B66-650 series Applied at a wet film thickness of minimum 4.0 mils or 1.5 mils dry.

B. Galvanized-Metal Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer, rust inhibitive, water based.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Sherwin-Williams; DTM Acrylic Primer, B66-000 series.

b. Intermediate Coat: Water-based acrylic, interior, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5).

1) Products: Subject to compliance with requirements, provide the following:

a) Sherwin-Williams; DTM Acrylic Semi-gloss, B66-150 series.

C. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat (Ceilings & Walls): Primer sealer, interior, institutional low odor/VOC.

1) Products: Subject to compliance with requirements, provide one of the following:

a) Sherwin-Williams; ProMar 200 Latex Primer, B28W02600. Applied at a wet film thickness of minimum 4 mils or 1.0 mils dry.

b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.

c. Topcoat (Ceilings, Bathroom/Shower Suites): Latex, interior, institutional low odor/VOC, low-sheen eggshell (Gloss Level 3).

1) Products: Subject to compliance with requirements, provide one of the following:

a) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex, B2402651. Applied at a wet film thickness of minimum 4.0 mils or 1.5 mils dry.

d. Topcoat (Ceilings, Dry Areas): Latex, interior, institutional low odor/VOC, flat (Gloss Level 1).

1) Products: Subject to compliance with requirements, provide one of the following:

a) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex, B30W02651. Applied at a wet film thickness of minimum 4.0 mils or 1.5 mils dry.

e. Topcoat (Walls): Latex, interior, institutional low odor/VOC, low-sheen eggshell (Gloss Level 3).

1) Products: Subject to compliance with requirements, provide one of the following:

a) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex, B20W12651. Applied at a wet film thickness of minimum 4.0 mils or 1.5 mils dry.

END OF SECTION 09 91 23

SECTION 09 97 23 – PENETRATING CONCRETE SEALER

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Surface preparation and the application of penetrating sealer for interior horizontal concrete substrates as indicated.
2. Supplementary components and accessories normally furnished or otherwise necessary for a complete application.

1.3 REFERENCES

A. Definitions:

1. Manufacturer: Means the penetrating concrete sealer manufacturer unless otherwise indicated.

1.4 ACTION SUBMITTALS

A. Product Data: For each product specified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply coatings only when temperatures of surfaces indicated to be coated, relative humidity, and ambient air temperatures are within range recommended in writing by the manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Penetrating Concrete Floor Sealer: Deep penetrating product that chemically reacts with concrete to permanently seal, densify, and harden surfaces, and make them water resistant.

1. Products: Subject to compliance with requirements, provide one of the following:

a. “Euco Diamond Hard” manufactured by The Euclid Chemical Company.
b. “L&M Seal Hard” manufactured by LATICRETE International. Inc.
c. “LIQUI-HARD” manufactured by W.R. Meadows, Inc.

B. Protectant and Densifier Finish Coat: Clear, water-borne polymeric protectant with UV absorbers to be used with penetrating concrete floor sealer and provide gloss finish.

1. Products: Subject to compliance with requirements, provide one of the following:

a. “Ultraguard” manufactured by The Euclid Chemical Company.
b. “L&M Lion Hard” manufactured by LATICRETE International, Inc.
c. “BELLATRIX” manufactured by W.R. Meadows, Inc.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Prepare new or existing slab surface to be sealed in accordance with manufacturer’s written instructions and as follows:

1. Surface to be dry, free from dark alkali spots, and clean from paint, plaster, grease, oil, soap, curing compounds, glue, and foreign matter which would prevent necessary penetration and subsequent reaction.
2. New concrete slabs to be cured a minimum of 28 days prior to application of architectural sealed concrete.

3.2 APPLICATION

A. General: Apply architectural sealed concrete finish according to manufacturer’s written instructions. Use applicators and techniques best suited for substrate conditions and to achieve desired aesthetic effects.

1. Protect adjacent surfaces from overspray and spills until application is completed and fully cured.

B. Concrete Sealer: Apply, directly from container, using bristle broom unless otherwise instructed by manufacturer.

1. Do not allow sealer to puddle.
2. Apply at least 2 coats of sealer allowing each coat to cure thoroughly before applying subsequent coats.
3. Apply finish coat in accordance with manufacturer's written instructions.

3.3 REPAIRS, PROTECTION, AND CLEANING

A. Correction: Dried excess sealer may cause a white residue to form on concrete. Remove residue by grinding or sanding, as recommended or required in writing by the manufacturer, and reapply.

END OF SECTION 09 97 23